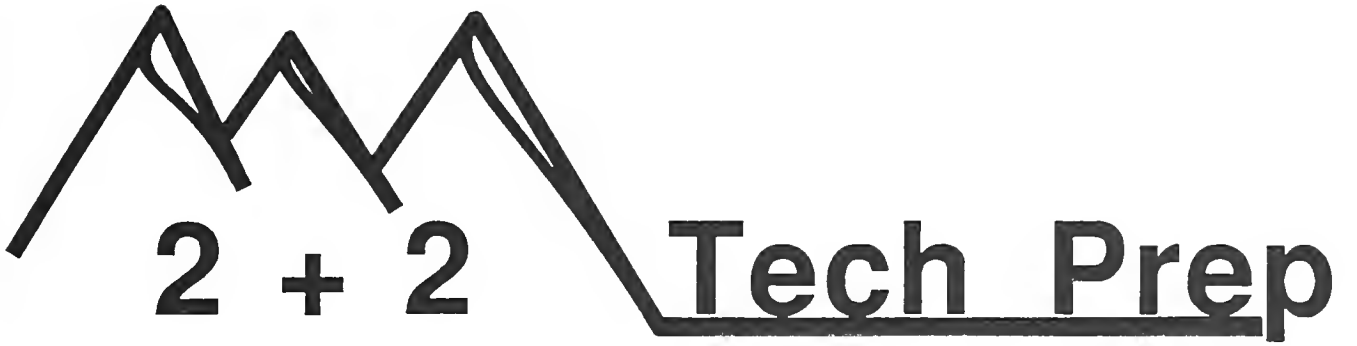

A RESOURCE GUIDE FOR INITIATING TECH PREP EDUCATION IN MONTANA

Montana Council on Vocational Education
Executive Management Building
1228 Eleventh Avenue
Helena, Montana 59620

Montana Council on Vocational Education

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2 + 2 Tech Prep

An Educational Program For Montana's Future

Montana Council on Vocational Education

What is Tech Prep?

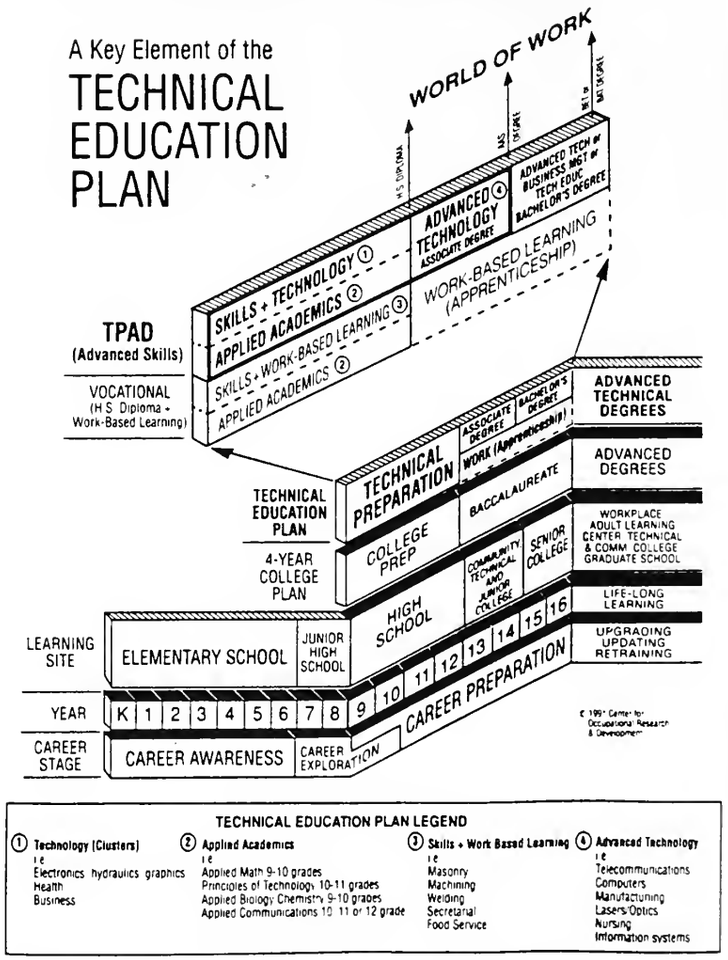
Tech Prep is the technical education alternative to College Prep. It is targeted for, but not limited to general education high school students, the "neglected majority." The Tech Prep concept rests on a foundation of applied academics, courses that incorporate real-life applications and hands-on experience into the teaching of academic subjects.[1]

Tech Prep is:

- A carefully designed curriculum that engages a high school student in a four year (2+2), or six year (4+2) plan to gain the competencies required for technical careers.
- A "viable solution for the forgotten half."
- A sequence of study beginning in high school and continuing through at least two years of postsecondary occupational education.
- A parallel program to college prep courses of study which presents an alternative to the general education program.
- Preparation for high-skill technical occupations allowing either direct entry into the workplace after high school graduation, or continuation of study which leads to a two-year certificate, an associate degree, or a bachelor's degree.
- A program which integrates academic and occupational subjects, placing heavy emphasis on articulation from secondary to postsecondary education.
- A competency-based, technical curriculum designed jointly by business/labor and secondary/postsecondary schools to teach essential competencies without duplication or repetition.

1. This definition is an adaptation of the one first offered by Dale Parnell in *The Neglected Majority* (1985) and reiterated by Dale Parnell and Dan Hull in *Tech Prep Associate Degree: A Win/Win Experience* (1991).

After completion of a strong academic and technical program in high school, Tech Prep students will be well prepared to continue their technical education at a postsecondary institution to acquire a certificate or associate degree, enter full time employment in their chosen field, or pursue a baccalaureate degree.



Source: Center for Occupational Research and Development.

2+2 TECH PREP

Major features basic to Tech Prep:

- **Contextual Learning.** Recent cognitive research indicates that the most productive approaches to teaching provide learning opportunities that take the student from (1) concrete to abstract, (2) specific to general, (3) practice to theory, and (4) familiar to unfamiliar.
- **Applied Academics.** Applied academics courses in Mathematics, Science, and Communications form the strong academic foundation of Tech Prep programs.
- **Local Partnerships.** Employers, labor representatives, parents, and community organizations have equal representation with secondary and postsecondary sectors in Tech Prep councils or steering committees during program planning and implementation.
- **Articulation.** Educators from elementary, secondary, and postsecondary institutions work together with business, industry, and community representatives to design and deliver curricula with a continuity that facilitates steady progress from one level of education to the next.
- **Associate and/or Baccalaureate Degree Potential.** Students may articulate into an associate degree program at a vocational-technical center or college, seek a baccalaureate degree from a four-year college, or enter the workforce well prepared for an entry-level position in a chosen field, while retaining the option to re-enter career training later.

For more information about Tech Prep, contact:

Montana Council on Vocational Education
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1228 Eleventh Avenue
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(406) 444-2964

Federal Funding Statement: Federal Vocational Education funds provided through P.L. 101-392, the Carl D. Perkins Vocational and Applied Technology Education Act of 1990, were used by the Montana Council on Vocational Education to produce this brochure.

Why is Tech Prep needed?

At a time when employers are demanding high performance in the American workforce, "more than half our young people leave school without the knowledge or foundation required to find and hold a job," according to a 1991 report from the U.S. Department of Labor. Today's workplace requires advanced technical skills and an ability to understand complex theories and processes in rapidly changing and emerging technologies. Most jobs that offer growth, challenge, and earning potential require a working knowledge of math, science, technical principles, and information/communications skills. Students well educated in the rigorous applied academics as well as technical areas can transfer their knowledge of principles, concepts, and technologies to practical applications in a variety of technical jobs.

Who benefits from Tech Prep?

American society and the economy will certainly benefit by the development of a world-class workforce which will enable American business to compete effectively in the world market. Cooperation at different levels of education will eliminate program duplication and provide greater efficiency in the development of human resources in our nation.

- Students benefit by developing strong academic competencies while obtaining a quality technical education. They develop the competence and confidence to succeed in a fast-changing, high-tech society.
- Employers benefit from the availability of better educated workers.
- High schools benefit because more students have a reason to complete their education. The tone and morale of high schools will improve as more students engage in a purposeful and substantial educational program.
- Postsecondary institutions can raise the level of their programs to provide advanced skills because entering students will be better prepared. Spending less time and fewer resources on remedial and developmental education programs, colleges and vocational-technical centers will be able to spend more on increasingly sophisticated technical programs.

A primary goal of Tech Prep focuses on learning outcomes achieved through multiple learning environments and teaching strategies which involve secondary and postsecondary institutions, business and labor, and government.

How is Tech Prep Implemented?

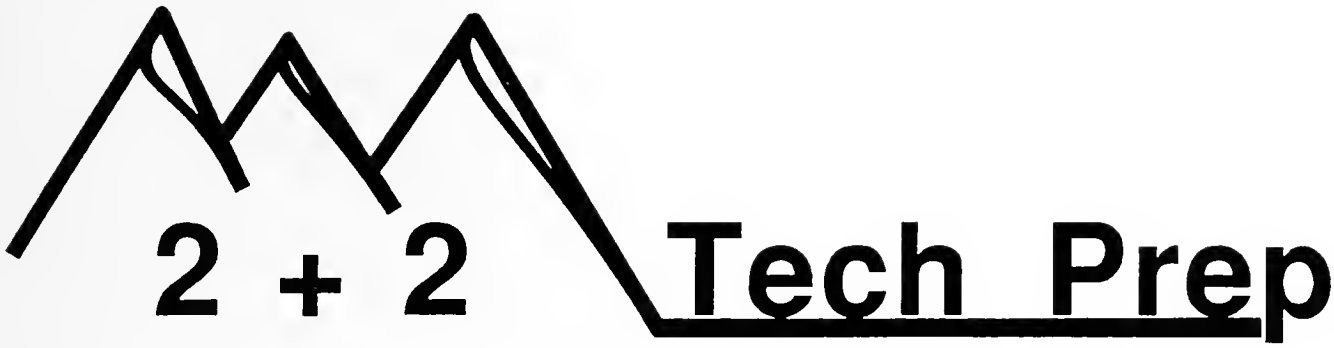
Tech Prep has been implemented regionally in various parts of the country over the past decade. With the enactment of the Tech Prep Education Act as part of the Carl D. Perkins Vocational and Applied Technology Education Act of 1990, Tech Prep has now been implemented in all 50 states. Although federal funds have been used for planning and demonstration projects since the Tech Prep Education Act was passed, many programs have resulted from local or regional initiatives spearheaded by educators, administrators, or state officials. In the words of former Assistant Secretary for Vocational and Adult Education, Betsy Brand, "Tech Prep is a local initiative and it needs to be maintained as a local initiative." Tech Prep begins with a vision for equal educational opportunity for all students, and culminates in a team effort involving students, parents, business and industry, the community, and schools.

Resources

In 1992, the Montana Council on Vocational Education commissioned a study regarding Tech Prep planning and implementation. The resulting report, *2+2 Tech Prep: A Resource Guide for Initiating Tech Prep Education in Montana,* can be obtained by contacting the Council at (406) 444-2964.

Additional Tech Prep resource materials can be obtained from the National Tech Prep Clearinghouse of Resources at:

East Central Curriculum Coordination Center
Sangamon State University, F-2
Springfield, IL 62794-9243
(217) 786-6375.



A RESOURCE GUIDE FOR INITIATING TECH PREP EDUCATION IN MONTANA

Report Produced By Rob Young
Under Contractual Agreement
With:

Montana Council on Vocational Education
Executive Management Building
1228 Eleventh Avenue
Helena, Montana 59620

June, 1993

Federal Funding Statement: Federal Vocational Education funds provided through P.L. 101-392, the Carl D. Perkins Vocational and Applied Technology Education Act of 1990, were used by the Montana Council on Vocational Education to produce this publication.

TABLE OF CONTENTS

PROJECT OVERVIEW

This report results from a study conducted by Rob Young, Assistant Professor at Northern Montana College, under contractual agreement with the Montana Council on Vocational Education. The report focuses on the following major project objectives:

1. Report significant findings and observations from state and national literature regarding Tech Prep.
2. Report commonly accepted definitions of Tech Prep education at local, state and national levels.
3. Formulate rationale in support of Tech Prep education.
4. Analyze and report on Tech Prep programs in Montana.
5. Analyze and report on commonly used strategies, approaches, and models utilized to initiate and implement Tech Prep education.
6. Report on exemplary Tech Prep programs at the state and national levels.
7. Report major sources or references for obtaining additional information on Tech Prep education.
8. Formulate recommendations and suggestions concerning policies and directions for promoting and implementing Tech Prep projects.

The report is comprised of four parts. Part one provides insight into the Tech Prep education concept; outlines the history and development of Tech Prep education; examines the various definitions of Tech Prep resulting from federal legislation and state initiatives; analyzes Tech Prep's implications for education reform, and; examines the role of Tech Prep in the results of national studies and commissions. Part two outlines the present state of Tech Prep education: it includes exemplary state models, initiatives and policies, and an examination of the four pilot projects in Montana. Part three provides resources and suggestions for the development and implementation of Tech Prep programs. This part examines existing planning and implementation strategies and models, and provides resources for further study. Part four provides recommendations for actions and policy in Montana.

The purpose of this report is to provide a resource and information source to: educators and administrators considering Tech Prep for their schools; business and industry leaders interested in participating in Tech Prep education; state legislators and education leaders examining new ways to improve the results of our education system; and parents and students who are most affected by educational reform.

PART I

UNDERSTANDING TECH PREP

PART I: UNDERSTANDING TECH PREP

INTRODUCTION

Technology preparation, or Tech Prep, is the term used to refer to a relatively new and rapidly expanding education reform movement which is attracting a great deal of attention in the U.S. and abroad. Because of its rapid proliferation and simultaneous development in various regions, the term Tech Prep is not easily defined in simple terms. "Tech Prep" has been used to describe a philosophical shift in education; a pedagogical change in delivery of instruction; an approach to integration of academic and vocational/ technical education; a model for articulation; a method to improve cooperation between various levels of education, and; a link joining business and industry with education. In fact, the premise on which the Tech Prep concept has developed addresses each of these descriptions.

TECH PREP DEFINED

A study of leading Tech Prep initiatives, and numerous articles, papers, and reports, indicates that a comprehensive definition of Tech Prep focuses on a number of essential elements. Most programs follow along the lines of the definition first offered by Dale Parnell in *The Neglected Majority* (1985) and expanded by Parnell and Dan Hull (1991) in *Tech Prep Associate Degree: A Win/Win Experience*, which states:

> A Tech Prep/Associate Degree[1] Program is the technical education alternative to College Prep. It is targeted for, but not limited to general education high school students, the forgotten half. A Tech Prep/Associate Degree program rests on a foundation of applied academics, courses that incorporate real-life applications and hands-on experience into the teaching of academic subjects. A Tech Prep/Associate Degree program is a carefully designed curriculum that engages a high school student in a four year (2+2), or six year (4+2) plan to gain the competencies (knowledge, skill and values) required for technical careers. (p.46)

The "forgotten half" referred to in Parnell's definition relates to the middle two quartiles of American high school students who are neither preparing to enter baccalaureate programs through a college prep course of study, nor planning to enter the workforce immediately after graduation with preparation in job training. These

1 Tech Prep/Associate Degree, or TPAD, is a term which was introduced by Dale Parnell and adopted by a number of consortiums in various parts of the country. The more widely accepted term, Tech Prep, is used throughout this report except when referring to specific programs or quoting references which use TPAD.

students enroll in a slate of courses best described as the general education track. Parnell supports his call for the elimination of the general education track and its replacement by Tech Prep programs by reporting that the middle two quartiles of students are typically, according to studies:

- Underachieving in school in proportion to their abilities.
- Generally disinterested in classwork, taking the easiest courses possible.
- Most likely to dropout.
- Least prepared for a job.
- Most likely to eventually show up at a community or technical college underprepared and often requesting admission to a technical education program. (Hull & Parnell, 1991)

A comprehensive description of Tech Prep was developed in August, 1992 by the Organizational Affiliates of the National Tech Prep Network (NTPN). The network is an association which was created in August, 1991 by the Center for Occupational Research and Development (CORD) to provide support and resources to the field in the interest of developing Tech Prep. The roster of the Organizational Affiliates of NTPN includes, among others: the American Association of Community and Junior Colleges, the American Association of School Administrators, the American Vocational Association, the Council of Chief State School Officers, the National Association of Secondary School Principals, the National School Board Association, the National Alliance of Business, the American Society for Training and Development, the American Technical Education Association, the National Association of State Directors of Vocational Technical Education Consortium, and the National Center for Research in Vocational Education. The document, titled *Tech Prep/Associate Degree: A Concept Paper*, was developed for distribution to educators and administrators to provide a working definition of Tech Prep. Text of the paper first appeared in the August, 1992 issue of *Connections*, the newsletter of the National Tech Prep Network, and is reprinted here with the permission of NTPN.

Tech Prep/Associate Degree: A Concept Paper

The United States is engaged in a major education reform movement aimed at providing continuity of learning and quality educational opportunities for all students. The Tech Prep/Associate Degree program, a significant element of this movement, focuses on providing meaningful educational and career preparation for the majority of high school students who do not complete baccalaureate degrees. In 1992, nearly one-half million young people were enrolled in Tech Prep/Associate Degree programs designed and developed through collaborative support and encouragement from communities, educators, and employers. Tech Prep programs challenge students and effectively prepare them to live and work in a highly technological society. These programs will provide the type of workforce our nation needs to compete once again in a global economy.

Combining secondary and postsecondary education programs through a formal articulation agreement, Tech Prep provides students with a non-duplicative sequence of progressive achievement leading to associate degrees in any of a number of technical and service careers. After completion of the strong academic and technical program in high school, Tech Prep students should be well prepared to continue their technical education at a two-year college[1] to acquire an associate degree, enter full time employment in their chosen field, or pursue a baccalaureate degree at a four-year college.

Why is Tech Prep needed? At a time when employers are demanding high performance in the American workforce, "more than half our young people leave school without the knowledge or foundation required to find and hold a job," according to a 1991 report from the U.S. Department of Labor. Today's workplace requires advanced technical skills and an ability to understand complex theories and processes in rapidly changing and emerging technologies. Most jobs that offer growth, challenge, and earning potential require a working knowledge of math, science, technical principles, and information/communications skills. Students well educated in the rigorous applied academics as well as technical skills can transfer their knowledge of principles, concepts, and technologies to practical applications in a variety of technical jobs.

1 Developed for Tech Prep/Associate Degree programs, this concept paper suggests that Tech Prep programs must culminate in an associate degree. In fact, Tech Prep programs need only be built on the fundamental concepts of articulation; partnerships involving business/labor, community, and education; a strong academic foundation; contextual learning strategies, and; include at least two years of postsecondary education leading to an associate degree or certificate in a technical field. Postsecondary preparation may be provided by a vocational-technical center, community college, private technical institute, two-, or four-year college, or apprenticeship program.

What is Tech Prep? Tech Prep is a sequence of study beginning in high school and continuing through at least two years of postsecondary occupational education. The program parallels the college prep courses of study and presents an alternative to the general education program. It prepares students for high-skill technical occupations and allows either direct entry into the workplace after high school graduation or continuation of study which leads to an associate degree in a two-year college.

The Tech Prep program integrates academic and occupational subjects, placing heavy emphasis on articulation from secondary to postsecondary education. Articulation between high schools and two-year colleges embodies a competency-based, technical curriculum, designed jointly by business/labor and secondary/postsecondary schools, which teaches essential competencies without duplication or repetition. The advanced skills required to complete an associate degree at the postsecondary level in a chosen career build on a strong academic and technical foundation at the secondary level. The curricula currently being designed for Tech Prep/Associate Degree programs will prepare better educated workers with advanced skills and the ability to transfer skills as technology changes.

Who benefits from Tech Prep? American society and the economy will certainly benefit by the development of a world-class workforce which will enable American business to compete effectively in the world market. The cooperation at different levels of education will eliminate program duplication and provide greater efficiency in the development of human resources in our nation.

• Students enrolled in the programs are the big winners in Tech Prep. They develop strong academic competencies while obtaining a quality technical education. Even more important, they develop the competence and confidence to succeed in a fast-changing high-tech society.

• Employers benefit from the availability of better educated workers. The skilled worker shortages should be alleviated as Tech Prep programs become widely operational across the country.

• High schools benefit from implementing Tech Prep programs because more students have a reason to complete their education. The tone and morale of high schools will improve as more students engage in a purposeful and substantial educational program.

• Postsecondary institutions can raise the level of their programs to provide advanced skills because students will be better prepared for college-level courses. Spending less time and fewer resources on remedial and developmental education programs, two-year colleges will be able to spend more on increasingly sophisticated technical programs, providing a foundation for continued learning and career development.

What characteristics do successful programs manifest? A primary goal of Tech Prep focuses on learning outcomes achieved through multiple learning environments and teaching strategies which involve secondary and postsecondary institutions, business and labor, and government. Major features basic to the design and development of Tech Prep programs include:

• **Contextual Learning.** Many students perform poorly in school because current learning styles do not address the way they learn. They do not learn well in the abstract; they are experiential learners. Findings from cognitive research indicate that the most productive approaches to teaching provide learning opportunities that take the student from (1) concrete to abstract, (2) specific to general, (3) practice to theory, and (4) familiar to unfamiliar. A curriculum of applied academics—a careful balance of head skills and hand skills— incorporates all of these concepts and makes learning understandable, achievable, and attractive for experiential learners.

The Tech Prep curriculum runs parallel to the college prep program in high schools, presenting a rigorous body of knowledge in a contextual setting and relating it to personal or social situations relevant to the workplace. Applied academics in mathematics, science, and communications form the strong academic foundation for the Tech Prep program which will enable students to understand complex technologies and new skill requirements in work environments. The program tolerates no "watered down" courses but maintains the same academic integrity as the college prep curriculum, expanding occupational education to include academic development.

Applied academics courses address fundamental principles of productivity, teamwork, and flexibility needed in the workplace. Inclusion of applied academics in the Tech Prep curriculum provides the opportunity to build a solid foundation in fundamental courses in the early part of the high school program and to introduce the concepts of technology on that strong base. Because of the sound academic base, the student can advance to a specialty in the associate degree plan at a two-year college or seek a baccalaureate degree at a four-year college.

• **Local Partnerships.** Employers, labor representatives, parents, and community organizations have equal representation with secondary and postsecondary sectors in Tech Prep councils or steering committees during program planning and implementation. The business/labor community identifies student outcomes required for future as well as current jobs; reviews curricula and course content for job relevance; and participates with educators to develop and provide work-based learning experiences such as shadowing, mentoring, cooperative learning, internships, apprenticeships, etc. Comprehensive and intensive partnerships must be developed and maintained between academic and occupational/technical education, secondary and postsecondary education, education and business/labor, and education and state/local government.

• **Articulation.** Articulation is a process for coordinating the linking of two or more educational systems within a community to help students make a smooth transition from one level to another without experiencing delay, duplication of courses, or loss of credit. Educators from elementary, secondary, and postsecondary institutions will work together to design and deliver curricula with a continuity that facilitates steady progress from one level to the next.

• **Career Exploration and Counseling.** Career awareness activities are essential for promoting Tech Prep/Associate Degree programs and recruiting students for the programs. This function involves a comprehensive, coordinated career counseling network of the facilities, programs, and skills of junior high/middle school, secondary, and postsecondary counseling professionals. To increase intelligent career choices, programs in career awareness, career exploration, and career/educational planning should begin at the elementary school level and continue throughout the college experience. The effort includes familiarizing students with many different job/career options, providing information on what is required to be successful in the positions, and leading students to discover and explore their own interests and aptitudes.

• **Associate and/or Baccalaureate Degree Potential.** The fundamental courses prepare students thoroughly and proficiently for a variety of options after graduation from high school. Students may articulate into an associate degree program at a two-year college, seek a baccalaureate degree from a four-year college, or enter the workforce well prepared for an entry-level position in a chosen field, retaining the option to re-enter career training later. The Tech Prep curriculum incorporates a series of exit/re-entry points, each of which leads to a specific but progressively higher job classification.

• **Elevated Postsecondary Curriculum.** The curricula of postsecondary institutions can be revised to an academic level consistent with expectations for college courses. Students entering college from a Tech Prep course of study in high school will be prepared to master advanced courses.

It may be several years before significant numbers of students will be graduating from secondary Tech Prep programs. Eighty percent of the people who will make up America's workforce in the year 2000 are already adults. Recent high school graduates as well as older adults in the community who desire to acquire associate degrees — the desired degree in many career fields in the future — may need preliminary academic assistance. A one-semester program, a "bridge program," includes academic foundation courses and some technical courses necessary to succeed in advanced associate degree programs. This program provides the essential elements contained in a high school Tech Prep program. A "bridge program" allows postsecondary schools to maintain or even raise the level of their course content to provide increasingly advanced skills.

What ensures a successful Tech Prep program? Business/labor and government cooperate with education in a successful program. Employers who play an active role in the program can pique students' interest, help them form practical and realistic ideas about the world of work, and motivate them through awareness of career possibilities and expectations. Providing work-based learning opportunities that take students beyond the classroom will correct preconceived notions, erase misconceptions, and instill appropriate ideas about what is expected of them when they finish school.

In educational reform movements, teachers and principals are the ones who facilitate systematic changes at the foundation, thereby determining the degree of success of innovative programs. Teachers and principals must be included in all phases of planning and implementation of new Tech Prep programs. Appropriate inservice training and adequate resources will accommodate the achievement of Tech Prep goals effectively and efficiently.

The federal government has devoted significant funds to the support of Tech Prep through the Carl D. Perkins Vocational and Applied Technology Education Act of 1990. This support is accompanied by increased expectations for documenting the successful integration of occupational and academic learning. For continuing and long-term success, however, local resources must be reallocated to support the needs of the established Tech Prep programs.

The Tech Prep/Associate Degree concept offers an answer to America's mandate to improve our educational system and to remain competitive in the world market. A successful program promises to upgrade front line workers, improve the productive capacity of entry-level workers, and provide quality education for all students. With the cooperation, participation, and commitment from secondary and postsecondary educational establishments, local employers, teachers, parents, and students, the program will serve as an agent of positive change for the American workforce as well as the educational system.

THE TECH PREP EDUCATION ACT

A number of studies and commissions of the mid-to-late 80's and early 90's point to the growing concern that America is not providing an adequate education to large numbers of its student population. *The Forgotten Half* states that "as young Americans navigate the passage from youth to adulthood, far too many flounder and ultimately fail in their efforts...this is especially true of the 20 million non-college-bound young people we have termed the Forgotten Half" (William T. Grant Foundation, 1988).

America's Choice: high skills or low wages! predicts that 70 percent of the jobs in America will not require a 4 year college education by the year 2000 (The Commission on the Skills of the American Workforce-CSAW, June 1990). Yet education and society continue to push too many students into college prep programs where they are ultimately unprepared or unmotivated to succeed. As reported by University of California researcher, Carolyn Dornsife (1992), in 1984 the National Commission on Secondary Vocational Education in *The Unfinished Agenda* concluded that:

> secondary schools must offer vocational programs that provide students with theory and application of academic material, the development of general employability skills, training in specific occupational skills, and career guidance. These programs should also provide students with a thorough awareness of career development before entering high school, and ensure a smooth transition to postsecondary institutions in order to continue their training. A transition...is fostered through articulation efforts such as coordinated Tech Prep curriculum. (p. 18)

In response to the calls for educational reform and a recognized need to better align education with the world of work, the 101st Congress passed the Tech Prep Education Act as part of the Carl D. Perkins Vocational and Applied Technology Education Act Amendments of 1990. With the enactment of this legislation, Tech Prep gained a national definition which retains key elements of Parnell's concept, while providing for flexibility among sites and states. Specifically, section 347(3) states, "The term 'Tech Prep education program' means a combined secondary and postsecondary program which -

(A) leads to an associate degree or 2 year certificate;
(B) provides technical preparation in at least one field of engineering technology, applied science, mechanical, industrial or practical art or trade, or agriculture, health, or business;
(C) builds student competence in Mathematics, Science, and Communications ... through a sequential course of study, and;
(D) leads to placement in employment."

(United States Statutes at Large, 101st Congress, 2d Session, 1990).

Unlike the program proposed by Parnell which calls for a Tech Prep/Associate Degree (TPAD), the federal act requires only that Tech Prep programs:

> Consist of 2 years of secondary school preceding graduation and 2 years of higher education, or an apprenticeship program of at least 2 years following secondary instruction...designed to lead to an associate degree or *certificate* in a specific career field. (emphasis added)
> (Sec. 344(b).)

Key elements and objectives of Parnell's Tech Prep concept were included in the language of the federal legislation as is evident in Sec. 342(a) and (b) which states:

> The establishment of systematic technical education articulation agreements between secondary schools and postsecondary educational institutions is necessary for providing youths with skills in the liberal and practical arts and in basic academics... and with the intense technical preparation necessary for finding a position in a changing workplace.
> It is the purpose of this part ... to provide, in a systematic manner, strong, comprehensive links between secondary schools and postsecondary educational institutions.

The firm commitment to articulation, increased skills through integrated academic and vocational/technical education, and comprehensive links between secondary and postsecondary institutions, and between education and industry reflects a national sensitivity to the needs of the workplace for a better trained and better educated workforce.

KEY ELEMENTS OF TECH PREP EDUCATION

Applied Academics/Experiential Learning

Tech Prep is designed to provide a focused, relevant curriculum to students who traditionally have not fared well in the abstract, theory-based curriculum of college prep. The Tech Prep concept associates real-life experiences with learning in an application-rich context, thus providing students with clear goals as to where their curricular programs are taking them. While it employs the "learn by doing" methodology of vocational programs, Tech Prep is not simply a replacement for vocational education. It is separated from present vocational programs by its requirement of a stronger

WHERE DO APPLIED ACADEMIC COURSES FIT ?

	9th Grade	10th Grade	11th Grade	12th Grade
MATH	APPLIED MATH I	APPLIED MATH II	ALGEBRA II	FORMAL GEOMETRY
SCIENCE	APPLIED BIOLOGY/ CHEMISTRY	PRINCIPLES OF TECHNOLOGY I	PRINCIPLES OF TECHNOLOGY II (OPTIONAL)	
ENGLISH	ENGLISH I, II, III AND APPLIED COMMUNICATIONS			
HUMANITIES	GEOGRAPHY, HISTORY, AND GOVERNMENT			
OTHER			VOCATIONAL EDUCATION CONCENTRATION	

Source: National Tech Prep Network

Figure 1.

foundation in the academic disciplines of Mathematics, Communications and Science. Tech Prep further differs from college prep in the presentation of these disciplines through an applied methodology. Because of the nature of the targeted middle-sixty-percent of high school students, the integration of academic and vocational-technical

education through applied academics and contextual-learning strategies is a key element of the Tech Prep concept. By 1991, several applied academics curriculums for integrating academic and vocational education had been developed in math, science and communications. These include: two levels of Principles of Technology (Applied Physics); two levels of Applied Mathematics; Applied Communication, and; Applied Biology/Chemistry. (See Figure 1.)

Articulation

A second key element of the Tech Prep concept relates to relevance of curricular programs. A course of study which is relevant to students' future positions in the workforce should not require them to repeat coursework previously mastered, nor should it impose gaps in the transition from one level to the next. Coordination and continuity within and between programs is essential to successful Tech Prep programs. Articulation in Tech Prep goes far beyond the acceptance of credit from another institution or educational level: it represents a redesign of entire curricula so that students can transition smoothly from secondary to postsecondary education or the workforce without repetition or deficiencies. Evident in most of the Tech Prep programs studied was careful consideration to horizontal articulation, or the opportunity for students to re-enter the college prep curriculum. Tech Prep must avoid "tracking" of students and should, instead, offer additional choices. In one form of Tech Prep, 2+2+2, a completed Associate Degree is designed to articulate with a baccalaureate program, thus providing three levels of vertical articulation.

Career Clusters

Career Clusters are designed to build stronger foundations, increase competency levels, and provide opportunities for student choice. According to Dan Hull (1992), career clusters are..."based upon the concept that there are clusters of occupations/jobs that require common basic skills and knowledge, and therefore it is possible to design a curriculum that has a basic skills and technical core of courses common to several related specialties. All students within a cluster take the basic skills and technical core classes together (approximately 80% of the curriculum) and then take their specific specialty courses."

Career clusters involve larger numbers of students in common classes and provide a stronger and broader base on which to build the specialty area. Because the career cluster approach provides for parallel development in basic skills and core competencies across clusters, there is opportunity for individuals to change specialties without encountering deficiencies in their preparation. This approach requires a regional analysis of task lists/job skills with input from industry in order to establish the components or

key elements which should comprise the core curriculum. The concept is built upon and incorporates basic skills courses (applied academics taken by all students) and technical core courses (taken by all students within a career cluster) which form a foundation for the specialties. (Hull, 1992) Hull reports that four career clusters appear to be forming nationally. These are: engineering/industrial, business/information systems, health/human services, and arts/humanities. (See Figure 2.)

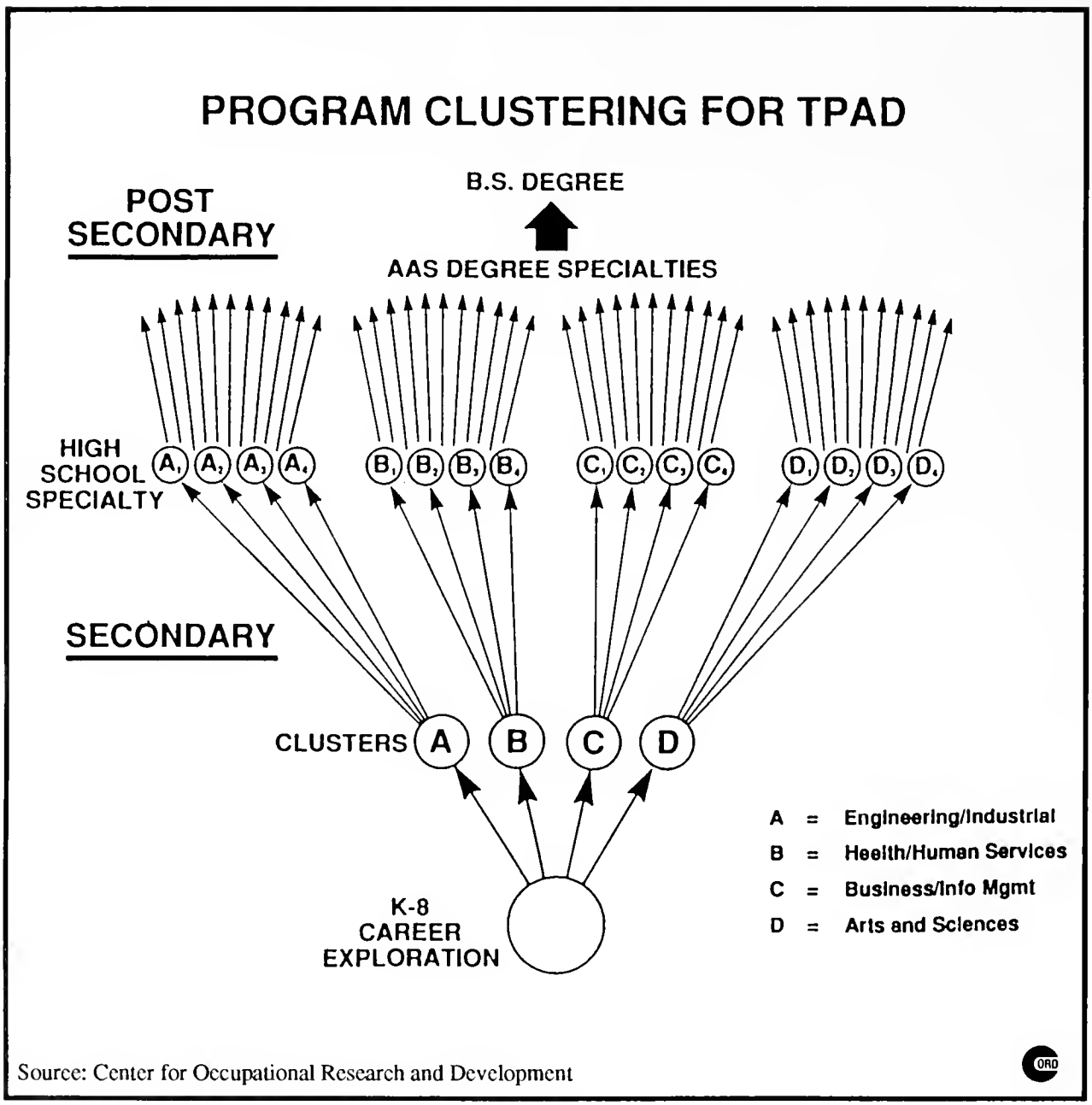


Figure 2

Partnerships

Tech Prep is further defined by the partnerships that it fosters between the community, the schools, and business and industry. Because Tech Prep involves competency based education, business and industry play an important role in the selection and validation of the competencies to be learned as well as in providing work-based learning opportunities. They, along with community leaders and organizations are key players in planning and promoting the Tech Prep program. Secondary and postsecondary, vocational and academic faculty collaborate to develop curriculum and strategically plan, implement, assess and improve Tech Prep in consultation with business and community representatives and school administrators. Tech Prep, by design, is a collective effort intended to benefit students, schools and communities.

EVOLUTION OF THE TECH PREP CONCEPT

Although the concept of Tech Prep includes components of educational reform which pre-date contemporary movements (i.e., articulation, integration of academic and vocational education, etc.), the principle elements of today's Tech Prep programs can be traced to efforts undertaken by the Center for Occupational Research and Development (CORD) nearly 20 years ago. CORD began its early work in the 1970's and early 80's developing engineering - technology curricula with a "common-core" curriculum to serve a cluster of more specific engineering occupations. This "common-core" model has been adapted and implemented in what is now known as Tech Prep education in which a common core is used as a method to teach basic skills and academic skills through applied learning -- leading to improved performance in more occupational-specific career clusters including health care, electrical/mechanical technologies, business/marketing technologies, agriculture/agri-business and certain craft-home economics specialties among others. These fields represent career clusters especially appropriate for those high school students typically identified as 'general education students' (Hull and Parnell, 1991).

Education reform efforts of the 1980's, based on "back to the basics," with more classes, more time, and more testing "resulted in modest gains in basic skills achievement, but performance in the higher-order skills required for high performance continued to be disappointing" (Secretary's Commission on Achieving Necessary Skills - SCANS, 1992).

Tech Prep reform efforts which target the general education student are built around a strong academic core; provide skills and competencies relevant to work and to further learning; are designed to develop higher-order thinking and communication skills, and

are well suited to the fastest growing, "middle range" of occupations over the next decade (Hull and Parnell, 1991).

Education and the Economy

Between 1984 and 1989 the Southern Growth Policies Board, a consortium of business and government leaders from 12 southern states, the Southern Technology Council, and the Southern Regional Education Board examined technology-related issues to improve economic development. Resulting actions and recommendations included: the development of standards for integration of math and science competencies into vocational education programs; cooperation of high school and community college administrators to ensure smooth transition between educational institutions, and; assessment of existing programs providing this transition such as Tech Prep programs in Richmond County School District, North Carolina. (Dornsife, 1992)

In a study conducted for the National Center for Research in Vocational Education, Dr. Carolyn Dornsife (1992) reports:

> As a result of [these] efforts by federal policy makers, educators and business leaders, by the late 1980s many curriculum changes had occurred in secondary and postsecondary institutions. In particular, over thirty-four state representatives reported the establishment of Tech Prep programs between various secondary and postsecondary institutions. Some states also mandated the use of competency-based vocational education curriculum and the development of articulated programs between secondary and postsecondary institutions. (e.g., Delaware, Indiana, and Oregon).

Widespread interest in Tech Prep -- even preceding federal involvement through the Tech Prep Education Act -- is indicated by University of California Economist, David Stern (1990) who writes: "There were 122 programs in 33 states as of June 1990 -- three states have mandated the creation of Tech Prep programs and six more are considering doing so."[1]

1 A Feb. 12, 1993 telephone interview with Laura L'Esperance of the National Tech Prep Network/CORD failed to disclose which states had mandated Tech Prep prior to 1990. According to NTPN records, fewer than 100 true Tech Prep projects were in operation prior to the Perkins Act of 1990, leading Ms. L'Esperance to believe that it is doubtful that any states had mandated Tech Prep at that time. A possible explanation offered was that, "during the 1980's, many projects in articulation and applied academics called themselves Tech Prep, but were not truly Tech Prep." Ms. L'Esperance reported that: there are presently more than 1200 Tech Prep projects operating, 840 of which were funded the first year of the current Perkins Act; fourteen states presently have bills proposed or passed regarding Tech Prep, and; the most active states appear to be North and South Carolina, Indiana, Oregon, Kentucky, Illinois, Wisconsin, and Michigan.

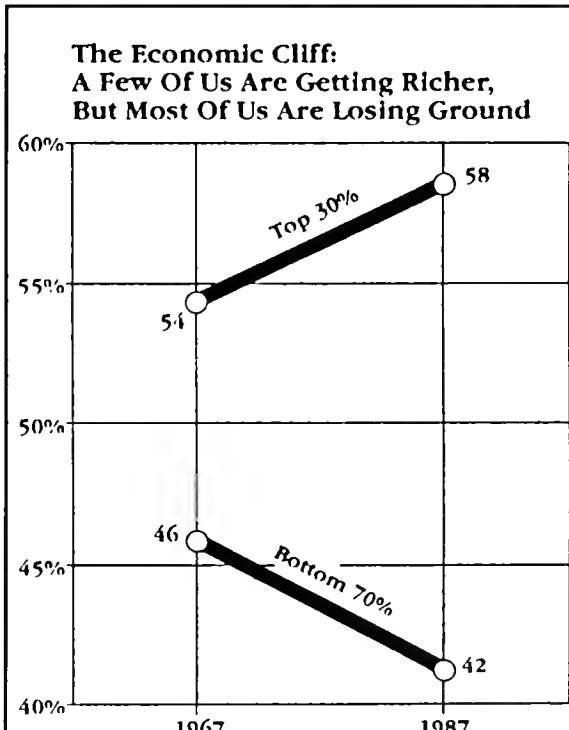
By July 1, 1991 there were approximately 380 Tech Prep programs in the nation. With the passage of the Tech Prep Education Act and its initial 63.4 million dollar allocation divided among all the states, Dr. James L. Hoerner, NCRVE researcher, predicted that some 800 to 1000 Tech Prep Programs would be initiated by July 1992 (Hoerner, 1991).

THE CASE FOR TECH PREP

It would be impossible to describe Tech Prep outside of the context of the social, economic and political conditions which have led us to this point in our educational history. An examination of factors which have led to the development of Tech Prep is imperative to the full appreciation of what is presently taking place across the United States.

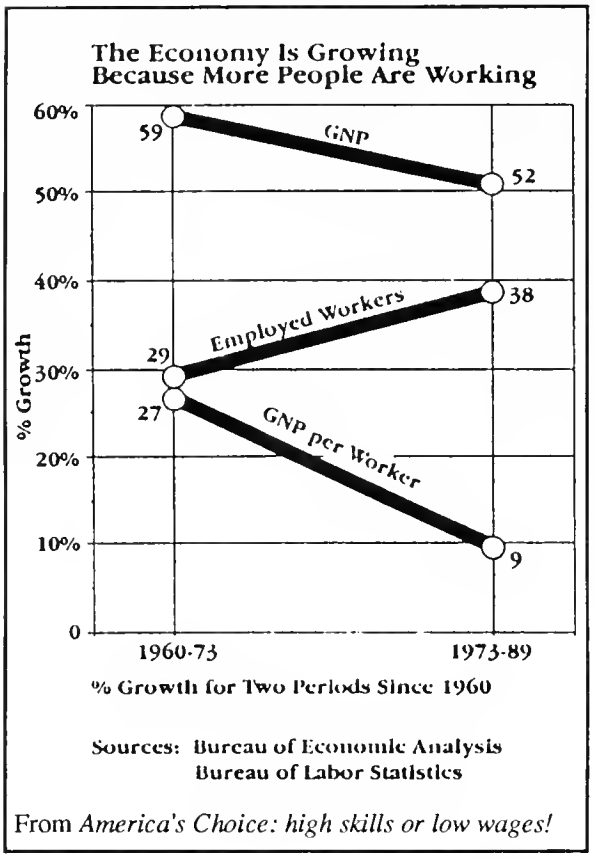
Context for Change

In its 1990 report, *America's Choice: high skills or low wages!*, the Commission on the Skills of the American Workforce (CSAW) examines the social and economic conditions which have provided much of the impetus for reform efforts such as Tech Prep. The Commission reports that our competitive edge in the international marketplace is being eroded by the high performance work organizations of our international competitors. This is evident in the slumping performance of our national economy which dropped from an average annual growth rate of 3 percent between 1937 and 1973, to less than 1 percent since 1973 (SCANS, 1992). More disturbing is the evidence that even this lackluster growth is not due to increased per-worker productivity, but rather, is largely due to an increase in the percentage of the population working: 50 percent of our population is presently working compared to 40 percent in 1973. Productivity gains due to employing greater numbers have not resulted in higher wages: instead, real average weekly earnings have dropped more than 12 percent



From *America's Choice: high skills or low wages!*

since 1969; the highest earning 30 percent of American families have increased their share of national income from 54 percent to 58 percent with a corresponding decrease for the bottom 70 percent (between 1967 and 1987); the earnings gap between white collar professionals and skilled tradespeople has gone from 2 percent to 37 percent, and; earnings of college educated males age 24 to 34 has increased 10 percent over the past decade compared to a decline of 9 percent for the same group holding only a high school diploma, and a decline of 12 percent for those without a high school diploma (CSAW, 1990).



From *America's Choice: high skills or low wages!*

All of these indicators point to a pressing need to restructure education and workplaces for high performance as called for in *America's Choice* and reiterated in the SCANS report, *Learning a Living: A Blueprint for High Performance.* It is acknowledged in each of these major studies that education should not become a tool primarily for churning out workers at the expense of a full and liberal education which prepares our population for citizenship and participation in a democratic society, however, the high performance, highly technological society in which future workers will find themselves holds strong implications for educational reform. It will be characteristic of the high performance work organization to foster: self-directed multi-skilled teams; expanded skill content of jobs; life-long training and education; de-centralized decision making empowering workers to make day-to-day decisions, and; worker input on investment and work organization decisions.

In the past, the American education system of teacher-centered instruction which broke learning into distinct disciplines to be absorbed by students in rote fashion, was well suited to the "Tayloristic" model of work organization in which a relative few planned, supervised and solved problems for the majority of workers who held little responsibility beyond being reliable, steady and willing to follow directions. The high performance work organization will call for fewer levels of hierarchy and a well educated workforce capable of performing a range of complex tasks while participating in group efforts to solve problems and make important decisions. With increased responsibility will come higher wages and an increased standard of living for the 70 percent of the American workforce who do not require a college degree (CSAW, 1990).

According to *America's Choice*, the ability for American industry to compete internationally while paying higher wages to its front line workers will come from increased per-worker productivity coupled with improved quality, greater variety of products, and quicker response to changing consumer taste: an assumption supported by the commission's study of high performance work organizations of our international competitors.

So what does this mean for American education? While national studies and numerous state and private surveys do not lay the blame for America's economic woes on the backs of educators, they do indicate a need to radically change the way our education system does business. From California and Oregon to Rhode Island and the Carolinas, education reform literature cites the need to restructure education to better align school experiences and performance to the expectations and responsibilities placed on our citizenry beyond formal schooling.

TOWARD EDUCATIONAL REFORM

America's Choice is not unique in its call for a national system capable of setting high academic standards for the non-college bound and assessing achievement against those standards. Nor is it alone in recommending an educational performance standard for all students which is benchmarked to the highest in the world. *Learning a Living: A Blueprint for High Performance* released in April, 1992 by the Secretary's Commission on Achieving Necessary Skills (SCANS), concludes that:

- Teaching should be offered in context. "Learning in order to know" should not be separated from "learning in order to do."
- Improving the match between what work requires and what students are taught requires changing how instruction is delivered and how students learn.
- The entire community must be involved.

The Secretary's Commission, with strong representation from business, labor and education, conducted an extensive study involving interviews with hundreds of employers, supervisors and employees. The purpose was to define competency in the high performance workplace, and recommend actions leading to high performance in the economy and in education.

The SCANS report identifies five essential competencies and a three-part foundation of skills and personal qualities -- collectively referred to as the SCANS know-how -- which should be basic to the preparation of all students and current members of the workforce. (See Exhibit A)

The identification of a basic set of skills and competencies not only enables, but calls for an academic standard for all students; it links educational performance and outcomes to real world experiences, and perhaps most importantly, it provides a basis by which these competencies can be integrated into instruction across all disciplines.

WORKPLACE KNOW-HOW

The know-how identified by SCANS is made up of five competencies and a three-part foundation of skills and personal qualities that are needed for solid job performance. These are:

WORKPLACE COMPETENCIES: — Effective workers can productively use:

- **Resources**—They know how to allocate time, money, materials, space, and staff.
- **Interpersonal skills**—They can work on teams, teach others, serve customers, lead, negotiate, and work well with people from culturally diverse backgrounds.
- **Information**—They can acquire and evaluate data, organize and maintain files, interpret and communicate, and use computers to process information.
- **Systems**—They understand social, organizational, and technological systems; they can monitor and correct performance; and they can design or improve systems.
- **Technology**—They can select equipment and tools, apply technology to specific tasks, and maintain and troubleshoot equipment.

FOUNDATION SKILLS:— Competent workers in the high-performance workplace need:

- **Basic Skills**—reading, writing, arithmetic and mathematics, speaking, and listening.
- **Thinking Skills**—the ability to learn, to reason, to think creatively, to make decisions, and to solve problems.
- **Personal Qualities**—individual responsibility, self-esteem and self-management, sociability, and integrity.

Source: *Learning a Living: A Blueprint for High Performance*

EXHIBIT A

The method for recording achievement recommended by both *America's Choice*, and the SCANS report calls for student portfolios or resumes containing information about courses taken, projects and work experiences completed and assessment results. Beginning in the middle school years, students will begin amassing a cumulative record detailing their progress toward world class standards required for achievement of a Certificate of Initial Mastery (CIM). Not all students will achieve the CIM at the same time: the objective is for all students to achieve rather than to sort students into educational "haves" and "have-nots". Because the CIM, to be achieved at approximately age 16, is the gateway to further learning - whether it be college prep, Tech Prep, or advanced vocational skill through work-based learning - it does not represent tracking, but rather enables students to change their educational programs to match their interests and aspirations.

Many states, among them California, Oregon, and Wisconsin have adopted some form of the CIM concept recognizing that world class standards for all; cumulative outcome-based assessment portfolios; individualized and integrated learning paths connected to the world of work, and; increased opportunities for achievement rather than a single high-stakes moment of success or failure, can improve educational outcomes for all students.

In comparing the findings of the two major reports from CSAW and SCANS to Tech Prep reform literature, it seems evident that there exists a great deal of compatibility: that each compliments and facilitates the other. For example, Tech Prep represents an effective method for delivering the SCANS competencies, while the call for outcome-based assessment and learning connected to the world of work found in the national studies is consistent with the objectives of Tech Prep.

PART II

TECH PREP EDUCATION TODAY

PART II: TECH PREP EDUCATION TODAY

STATE POLICIES, INITIATIVES AND MODEL PROGRAMS

The development of Tech Prep Programs, in the words of Hull and Parnell (1991), "begins with creating a policy demand upon the educational system. This can be in the form of a directive from a state legislature supplemented by policy statements issued by local school and college boards." This was the course of action taken in a number of states prior to passage of the Tech Prep Education Act. Since passage of the Act, at least one researcher has expressed a major concern that "we are rushing forth throughout the nation, launching Tech Prep programs in every state in response to the Perkins Act without having identified the basic constructs or the underlying philosophy upon which the concept of Tech Prep should be built" (Horner, 1991).

By examining initiatives and model programs of states which have led the way in Tech Prep, the underlying philosophy can preserve the foundation for emerging Tech Prep programs - whether they are spawned by the Tech Prep Education Act, or are part of a state-wide educational reform initiative. It is with this purpose in mind that the policies, initiatives and models of the states of Indiana, Wisconsin, and Oregon are examined below.

Indiana

Tech Prep in Indiana began as a state-mandated initiative with PL-217-87, the Indiana Tech Prep Initiative. This public law had at its core, a curriculum initiative that: "is performance based; provides students with skills necessary to gain employment or to pursue further education upon high school graduation; relates to a broad scope of occupations; includes academic skills taught through practical application, and; allows for credit in high school and college and cooperative arrangements" (Wentling et. al. 1990).

The Initiative

The Indiana Tech Prep Initiative required the curriculum to: be performance based; provide students with skills necessary to gain employment or to pursue further education upon graduation; relate to a broad scope of occupational opportunities; include Math, Science, English/Language Arts courses taught through practical application and designed to meet graduation requirements for those subjects; be designed to include secondary and postsecondary sequence models; and allow for dual credit, advanced study and cooperative arrangements.

Pilot Tests

Beginning in the 1989-90 academic year, five pilot test sites, each with a unique prototype, began developing and implementing Tech Prep in Indiana. By establishing a Technology Preparation Task Force and Evaluation Committee, Indiana attempted to answer the following questions:

1. Is the target population being served?
2. Is progress being made toward achieving the program goals?
3. Is the curriculum performance based?
4. Are the science, math and language arts courses being taught through practical application?
5. Are the student outcomes in terms in competencies, the same as those for courses taught in the traditional manner?
6. How do local businesses, industry and labor groups perceive Tech Prep?
7. How do postsecondary personnel view Tech Prep?
8. What has been the impact of Tech Prep on school climate?
9. What changes have occurred in students' attendance, attitudes, career maturity and GPA's as a result of the program?
10. What features of the prototypes facilitate replication?
11. What are the barriers to implementing Tech Prep?
12. What resources are necessary to implementing the prototypes in other settings?

A thorough examination of methods and results from all five test sites over two academic years was conducted by Tim L. Wentling and is reported in *Technology Preparation Pilot Test: School Year 1989-90*, and *Technology Preparation Pilot Test - Year Two: School Year 1990-91*. Summarized below, are the significant findings from these reports. One prototype is examined in detail while unique variations are reported for the remaining sites.

Monroe County Community School Corporation Prototype

The Monroe County Community School Corporation prototype in Bloomington Indiana included Bloomington North Comprehensive High School with an enrollment of 1250 students and a separate area vocational center serving additional high schools in the area, and Bloomington South Comprehensive High school with an enrollment of approximately 1550 students.

ADMINISTRATIVE STRUCTURE

The vocational director was responsible for administering the project. The project manager in cooperation with the Bloomington North and South High school principals coordinated the overall activities related to classroom instruction and implementation; was responsible for communication and directing all activities involving the project team; articulated the Tech Prep activities horizontally between the curriculum teams and vertically between the secondary and postsecondary institutions; orchestrated staff development activities and continued curriculum development activities, and serves as the chief contact with the Department of Education.

GOALS

Major goals of the project, consistent with the state plan included:

1. Technological literacy for all general education students.
2. Increase student motivation and achievement in basic skill areas through applied courses in science, mathematics, and language arts.
3. Integrate the curriculum to better reflect the ways the knowledge and information are processed in our modern technological society.
4. Increase the number of students attending the postsecondary technical colleges and universities.
5. Increase the number of students ready to enter the world of work through the development of lifelong learning skills.

UNIQUE FEATURES

A number of features were unique to this prototype. First, the curriculum began at the ninth grade. It was felt that starting at the eleventh grade would not provide sufficient opportunity to build the base that is necessary for dealing with future technology. It was further believed that the general education student is too far along in the eleventh grade to turn around to the degree necessary and desirable.

Second, the Tech Prep curriculum was not sold as a new and separate program, but was portrayed as a strategy for possible inclusion into a redefined and reconstituted curriculum for entire schools.

THE CURRICULUM

The first year curriculum involved: Applied Physical Science, Applied Introductory Algebra I and II, and Applied Language Arts I and II. Tech Prep electives included: Keyboarding, Computer Applications and Introduction to Business. Second year curriculum included: Applied Biology I and II, Applied Introduction to Algebra III and IV, Applied Language Arts III and IV. Tech Prep electives included: Computer Applications, Computer Graphics and Introduction to Business. Year two of the program was unique in that Introduction to Algebra III and IV, Biology I and Language Arts III and IV curriculum were implemented with lead teachers developing and implementing the curriculum for other teachers to use.

RECRUITMENT

Rather than selecting one group of students and targeting them for Tech Prep, across the board implementation in the general education curriculum was sought. Since ninth graders were targeted for the first year of the program, recruitment of students from middle schools was necessary. Students from the middle schools had two avenues to enter the program: one by selecting introductory algebra, which leads directly into the general education curriculum, and the second, by self expressed interest in the program.

North Montgomery Community School Corporation Prototype

Found in a mainly rural setting, the high school enrollment of approximately 600 students annually, had access to limited vocational offerings. Approximately 40% of the school's enrollee's are considered college prep while another 10% would matriculate to a 2 year postsecondary trade school and/or the military. The management structure of the project differed in that it consisted of three groups: an advisory committee, steering committee and a task force. The advisory committee presented input and advice from the employer perspective. The steering committee had the overall responsibility for directing the project, hiring and supervising the personnel, handling fiscal matters, and reporting the progress of the project. The task force was comprised of experienced and presently practicing secondary and postsecondary educators from diverse disciplines. The task force created the curriculum model, designed the curricula, developed the courses and planned the marketing and piloting strategies and procedures.

RECRUITMENT

Students enrolling in the North Montgomery Tech Prep pilot program were recruited for the Tech Prep pilot project as opposed to entering the project simply by their course

enrollment selection. Marketing included: targeting sophomore students with an information handout and twenty minute presentation concerning Tech Prep; counseling sessions for a review of the students four year academic plan and final course selection, and; follow-up letters sent to parents advising them of student alternative programs.

Metropolitan School District of Wayne Township Prototype

UNIQUE FEATURES

This pilot employed a project manager half time to plan and guide development, implementation, and operation of the project. The project manager was responsible for overseeing the following committees: permanent planning committee, curriculum committee, implementation committee, and evaluation/oversight committee. Unique in this projects goals were: to increase the math, science and communication skills of students who enter the work force immediately after graduation from high school; to increase problem solving and critical thinking skills of general education students; to enable students to set obtainable educational and career goals in order to increase secondary retention and completion rates.

SCHEDULING AND CURRICULUM

Three period blocks of time in a specially designed laboratory were used for the courses. To ensure that the instruction was performance based, the faculty developed, with the assistance of the vocational director, a performance based matrix that charted the students achievement of competencies. Assistance was sought from local businesses to ensure practical real world application of the instruction. Course titles included the prefix Tech Prep, i.e., Tech Prep Mathematics.

STAFF DEVELOPMENT

Teachers were inserviced as to the development of performance based curriculum and practical application methods of instruction. Among resources used were the national-consortium-developed Applied Math, Applied Communications and Principles of Technology curriculum.

Indiana Vocational Technical College - North Central School Prototype

This project was managed by a staff member of the IVTC North Central. A Tech Prep counselor assisted by handling student services as well as marketing responsibilities. A unique goal was to develop an inservice training and development plan for secondary and postsecondary faculty, counselors and administrators to ensure that the Tech Prep curriculum would be implemented as successfully as possible. In the area of development, the inservice activities focused on workshops on team building, development of performance based curriculum, learning styles and teaching problem solving. This is significant in that the inservice activities were not dominated by learning about Tech Prep, but rather learning about components of methodology and teaching styles. Curriculum development involved the DACUM (Designing A Curriculum) process to determine and/or identify the competencies within a specific occupational area.

Bartholomew Consolidated School Corporation Prototype

Unique features in management and committee structure included a 26 member community group called the action group which helped with publicity, communication and keeping Tech Prep up to date in terms of economic conditions and needs. Unique features in the objectives of this pilot were: to encourage teachers, guidance counselors and administrators to cooperatively use technology for effective instruction of basic skills; to provide students a focus for a career or course of study; to involve business, industry and labor representatives with teaching professionals in the development, implementation, articulation, and evaluation of technology preparation curriculum, and; to develop an understanding of the value of a lifelong learning. The curriculum was not occupational specific, but instead, emphasized basic concepts students could adapt to future educational experiences. It was therefore, an option for all students, not just students interested in a specific area.

Two approaches or options were utilized at this site. Plan A - Tech Intensive, served either area vocational or comprehensive high schools in which students travelled to a Tech Prep site for a significant block of time to benefit from the equipment and teacher expertise of that school. Students were enrolled in a core of Tech Prep courses. Plan B - Tech Elective, was intended to serve a large student body, or a smaller high school with limited funds.

First year course offerings were:

<u>Plan A - Tech Intensive</u>
Tech Prep Integrated Math
Tech Prep Integrated Physics
Tech Prep Composition
Tech selective - Experiences in Technology

<u>Plan B - Tech Electives</u>
Electro/Physics Technology
Chemistry Technology

Courses in the Tech Intensive plan were offered in a block of time to allow for a core of students enrolled in all three courses.

This pilot project was unique in that each course was team taught by one technical and one academic teacher with the exception of Chemistry Technology, and Experiences in Technology.

Pilot Test Results

As part of the assessment of the pilot projects, an evaluation instrument was administered to secondary educators which involved three parts: two semantic differential parts addressing positive and negative aspects of Tech Prep, and one open ended evaluation. Revealing responses to the open ended question, "What are the positive aspects and potential effects you see for Tech Prep?" included: "more knowledgeable, prepared people for college or the work world"; "more attention given to average ability students"; "real world applications across the curriculum - relationships between what is learned and the real world becomes clearer"; "students see the relevance of curriculum/school"; "students are more motivated - gives general education students a focus."

Summary of Conclusions

Secondary

Major conclusions from the secondary educators survey included: overwhelming agreement that the use of applications in teaching and the integration of subject matter across courses are desirable elements of Tech Prep; strong support for the use of precise performance standards, articulation of programs, and the focus on the general education student population; agreement on the potential for Tech Prep to motivate students for current and continued learning, to provide more attention to average ability students, and to raise curriculum standards in regular courses.

Postsecondary

Responses to a similar question asked of postsecondary educators included: more directed motivated students; better prepared for work; important opportunities for students; more real-world and useful instruction; good recruitment tool for postsecondary institutions - increased knowledge of our programs and interest in technical careers; less remedial work will be required at the postsecondary level.

Industry

Industry and labor representatives surveyed reported: it provides the business community with employees who have exposure to current technology; [results in] better prepared workers for business and industry; gives students a better understanding of business and what is expected of them when they enter the work force, and; it should aid in drop out prevention.

Site Study Conclusions

Following assessment of the five pilot sites, the following conclusions were reported:

> Tech Prep has not been labeled a science math or vocational program in any of the sites. Instead it is viewed as a form of school reform that involves the use of different strategies of teaching for and about technology. This is viewed as a positive result, and it should facilitate widespread implementation. There is agreement among Tech Prep staff and evaluators that Tech Prep, to be effective in meeting the needs of students in the general education curriculum, must be packaged and marketed as an innovative approach to teaching foundations for working and living in an increasingly technological world. Delivering Tech Prep to intact student groups (several periods a day) has had positive consequences. It provides for greater opportunities for students to build strong relationships that are advantageous to cooperative learning and peer coaching. It also provides the instructors with the opportunity to integrate their instruction and assignments.

Summary of Task Force Findings

Regarding the questions to which the Technology Preparation Task Force and Evaluation Committee sought answers, the following conclusions were drawn:

> The content of Tech Prep courses is viewed as a more complex and a higher level than courses typically taken by the general education curriculum student. Teachers of Tech Prep believe that the Tech Prep students are learning more from applications: they are developing problem solving skills, critical thinking skills, team work, and a willingness to try new things.
>
> Many Tech Prep teachers have altered the way they teach in their other non-Tech Prep courses to be more like Tech Prep. Increased interaction

among teachers has been noted in all schools with interdisciplinary cooperation and coordination occurring at most schools. Many teachers have indicated that Tech Prep has "revitalized" them and has provided a new mission.

Changes have been noted in student attendance, attitudes, career maturity, and GPA's as a result of the program:

A. Tech Prep is providing an impetus to students for taking additional mathematics and science.
B. Tech Prep teachers agree that student attitudes toward school and learning have improved over the first pilot year.

In examining barriers to implementing Tech Prep, the task force identified among other things: a lack of sufficient lead time; a limited amount of leadership and technical assistance provided by the state department of education staff, and; the lack of a precise operational definition of Tech Prep as problems.

Resources necessary to implement the prototypes in other settings were identified as: staff development; creative, committed, and willing teachers; support of school principals and other instructional leaders; opportunities for statewide inservice and sharing sessions, and; a certain amount of equipment is necessary (although the amount is overstated and over estimated by most people).

Suggestions

Some important and revealing suggestions from the Indiana Tech Prep Pilot Project include:

1. Define Tech Prep in precise operational terms and provide parameters for the design and delivery of Tech Prep to include more specific selection and recruitment criteria for students.
2. Improve understanding of Tech Prep by communicating better with students, teachers, counselors, administrators, and community people.
3. Package and market Tech Prep as a strategy of instruction rather than as a stand alone equipment project.
4. Provide staff development opportunities for Tech Prep teachers regarding performance based curriculum development/adaptation and new teaching strategies.
5. On a state level basis, develop and package instructional applications that can be selected and implemented by Tech Prep teachers.
6. Establish a list of essential resources and equipment needed for the implementation of Tech Prep.
7. Establish the current pilot sites as demonstration centers and provide resources for assisting other school corporations in the implementation of Tech Prep.
8. Establish policies for bringing together secondary and postsecondary faculty and policies.
9. Initiate action to insure that postsecondary curricula is reformed to match the gains achieved in secondary Tech Prep.
10. Consider beginning Tech Prep earlier in the curriculum. (before 11th grade).
11. Provide Tech Prep core courses at all schools, but consider pooling resources to provide regional delivery of more expensive, advanced occupational components.

Results of the Pilot Test - Year Two, 1990-91

Sites, and first- and second-year Tech Prep students were evaluated in the same manner as for year one. The prototypes were found to be in compliance with state guidelines, incorporating features of the state model, and working toward the development of the levels depicted in the state model. Participation appeared to have a more positive effect on the attitudes of the 1990-91 students than on the 89-90 group. The majority of postsecondary educators were aware of, involved with and supportive of Tech Prep.

The site reporting the greatest increase in Tech Prep enrollment, Monroe County, had 300 freshmen and 200 sophomore students compared to 51 total in the first year of the project.

In addition to evaluations similar to the first year, each site was assessed as to its match with state guidelines and the further developed State Model.

State Model

Features of the State Model include:

1. A secondary school core of competencies in Mathematics, Science, English/Language Arts, Economics, Computer Literacy, and Career Awareness taught through practical applications.
2. An articulated secondary-postsecondary curriculum
3. Multiple entry points.
4. Team teaching and/or joint instructional planning across areas of instruction.
5. Teaching strategies which include application-based instruction, interdisciplinary instruction, and cooperative learning.
6. Learning activities which emphasize problem solving, critical thinking skills, teamwork, and cooperative learning skills.
7. Courses which are designed to promote mastery by being performance based.
8. Core competencies delivered through specific courses or through integration across areas of instruction.
9. Locally determined recommendations for electives.

There are three levels to Indiana's State Tech Prep Model. The first level is referred to as the Tech Prep Core Curriculum. Core competencies can be delivered through specific courses or through integration across areas of instruction. The second level is referred to as Specialized Tech Prep Curriculum and consists of three to five courses related to the technical area of preparation. The third level of the State Tech Prep Model is articulation with postsecondary institutions.

Summary of Second Year Findings and Conclusions

In general, participation in Tech Prep appears to have had a more positive effect on the attitudes of the 1990-91 students than on the 89-91 group. As the Tech Prep curriculum evolves at each of the sites, multiple entry points for students are increasing. Eventually, in each of the prototypes students will be allowed to study Tech Prep during the first year of high school.

Computer applications is one of the cornerstones of the Tech Prep curriculum across sites. Competencies in keyboarding and computer applications are taught directly in several Tech Prep courses and are integrated throughout most courses.

Computer information is an integral part of the Tech Prep instruction at each of the sites. There is concern and confusion as to the extent to which Tech Prep courses are or will be recognized as academic courses by four year postsecondary institutions.

Tech Prep has not been labeled a science, math or vocational program in any of the sites. Instead it is viewed as a form of school reform that involves the use of different strategies of teaching for and about technology. This is viewed as a positive result.

Suggestions

Suggestions from the second-year report include: establish and fund as many demonstration sites as possible where teachers and others can observe and discuss Tech Prep with those who have implemented it; provide direct and visible leadership at the state level; possibly establish a state level coordinating committee for Tech Prep; develop and communicate procedures and expectations for using the Tech Prep cadre; develop standard procedures and curriculum alternatives so that school corporations across the state will not be required to develop their own, and; work with four year institutions to reach agreement and understanding on the type and amount of credit that will be granted for Tech Prep courses in meeting admissions requirements.

Conclusion

Due to its early involvement in Tech Prep at the state level, Indiana's experiences stand as a model of the developmental stages of initiating a state-wide plan. The issues, concerns, and eventual policies derived can provide a baseline of information to consortiums or states examining the merits of Tech Prep for educational reform.

Wisconsin

Education Reform in Wisconsin

Wisconsin also advocates elimination of the general education track in high schools and replacing it with a purposeful Tech Prep program. According to the Wisconsin Department of Public Instruction, approximately 52% of the graduating seniors enroll in baccalaureate programs immediately after high school. Ten years later only half have completed a degree.

Definition of Tech Prep in Wisconsin

"Tech Prep is a sequence of courses and experiences designed to provide high school graduates with a more technically oriented background to enable them to make successful transitions from school to postsecondary technical education or to work. Tech Prep combines a common core of applied academic courses and technical courses at the high school level. Through these integrated curriculums, students will acquire the higher levels of skills required in the emergent work force. These curriculums provide for cooperation between high schools, technical colleges and the business community leading toward completion of an associate degree, diploma, or certificate program in a specific technical field."

Wisconsin's definition is broader in focus than the federal definition found in the Carl Perkins Act and thus allows any Wisconsin program to qualify to receive federal funds under the act.

Source: *Assuring Wisconsin's Economic Future (1991)*

Education for Employment

Wisconsin's Education For Employment Standard, adopted by the Department of Public Instruction in 1985, calls for programs designed so that all students K-12 have access to: business and education partnership activities; practical applications of basic skills; career exploration planning and decision making; employability skills and attitudes; school supervised work experiences; knowledge of business operations and economics; and contemporary vocational programs. Commencing with the 1991-92 school year each district was to have an Education for Employment Program approved by the State Superintendent of Public Instruction. Development was to be overseen by a local or regional council which draws at least half of its members from the business community. Each district must employ or appoint an Education for Employment counselor. Known as the Education for Employment Initiative, it has already seen national recognition for linking educational reform directly to the world of work and economic development.

Career Guidance

Wisconsin's Developmental Guidance Model is a comprehensive counseling and guidance service to all students based on a series of competencies identified for incremental stages of development K-12. The Developmental Guidance Model systematically teaches the students about the world of work and ways to make informed decisions about occupational options and career planning.

Articulation

Articulation and advanced standing options have been developed beginning at the curriculum development stage where joint secondary and postsecondary personnel, through federal demonstration grants, developed competency based curriculum to be incorporated in high schools leading to advanced placement and dual credit. Unique to this arrangement is that, in some areas, students enrolled in dual credit courses are taken to a postsecondary institution for additional specialized instruction and become acquainted with the various career options in their field of study. In another unique option, students in Fond du Lac receive technical college credit for courses which are jointly offered by secondary and postsecondary institutions and are based on the college's curriculum. Students receive both high school and technical college credit in courses such as accounting, data processing, human relations and sociology.

Partnerships

Wisconsin has established a governor's council on business and education partnerships, which has led to local regional councils being established in 350 communities. Wisconsin's Occupational Competency Program provides funding for vocational/technical and adult education instructors and high school teachers to become engaged in summer experiences in business and industry.

Policy

The policy actions in Wisconsin, while not specifically driven by Tech Prep, show a high degree of compatibility with the objectives of Tech Prep. Further development of educational reform in Wisconsin has consequently led to a rigorous study of, and implementation strategy for Tech Prep education. Results of a six month study by a joint task force of the Wisconsin Board of Vocational/Technical and Adult Education and the Wisconsin Department of Public Instruction identify issues related to: occupational

preparation, including the state's proposed Tech Prep and apprenticeship programs; successful policies and practices of Tech Prep and apprenticeship models to be modified to meet the state's needs, and; existing practices that hinder occupational options for students. The task force report entitled, *Assuring Wisconsin's Economic Future: Improving Occupational Options for Youth* (1991), strongly endorses Tech Prep programs as a way to prepare students for the future work force. Major assumptions include: that enhanced collaboration among educational systems is desirable; that traditional distinctions among college bound and non-college bound students create barriers to building integrated academic-vocational programs in high schools, and; that strong, continued leadership is required for the innovations recommended.

Task Force Recommendations

Highlights of the recommendations resulting from the task force report include:

1. All students should have the right to enroll in a Tech Prep program.
2. The Education for Employment Standard should be strengthened so that all students will have the foundation for Tech Prep.
3. A tenth grade performance based gateway test should be given.
4. Business and labor should be encouraged to participate.
5. All high schools and technical colleges should develop articulation.
6. School funding should be improved.

Expanding on the recommendations, the task force called for "a revised and strengthened Education for Employment Standard for all students in K-12 so that the skills, knowledge, and attitudes taught will serve as a foundation for Tech Prep options in the 11th and 12th grades and postsecondary technical education."

The report also called on state agencies to "implement in all school districts and vocational/technical and adult education districts by the 95-96 school year, Tech Prep program options consisting of the two years of secondary school preceding graduation and up to two years of postsecondary education, for continuation in a formal work-based learning program."

Rationale

In his summary, the Executive Director of the task force states that, "despite the existence of numerous high paying technical career options, at present only 11% of Wisconsin's high school seniors choose to pursue technical careers through the technical colleges following high school." The task force urges the implementation of a Tech Prep

initiative in Wisconsin to offer students viable options to the college prep and general curriculums: it understands Tech Prep to be a common core of applied academic courses and technical courses leading toward completion of an associate degree or certificate in a specific technical field, and recognizes the need for relationships between high schools, technical colleges, and the business community.

Preparation and Assessment

It is interesting to note that Wisconsin is adopting the recommendations of *America's Choice* and the SCANS report for benchmarked assessment and certification of initial mastery. Wisconsin's task force report recommends that Wisconsin adopt a set of common, essential learner outcomes which all students are expected to master and which reflect the philosophy of outcome based education which includes the following major categories:

1. Academic foundations
2. Analytic skills
3. Human relations
4. Personal growth
5. Global participation
6. Career and occupational awareness
7. Citizenship

The commission recommends benchmark performance based assessment at the following grade levels:

> third grade assessment of essential outcomes; sixth grade assessment of essential outcomes; interest, ability, and aptitude assessment provided through guidance and counseling services during grades 7 - 9; tenth grade assessment of essential outcomes, and; ongoing assessment of student performance in student branching options during grades 11 and 12 provided through guidance and counseling services.

Students failing to master the tenth grade gateway assessment will receive comprehensive and appropriate remedial or special education and support services designed to enhance the performance of the essential outcomes.

Achieving the Objectives

A summary of further recommendations arising from the work of the task force include:

- Formal transcripts, special certificates, and/or pupil portfolios documenting student participation and completion of the Tech Prep program which are acceptable to employers.
- An ongoing marketing and information plan that informs students, parents, teachers, counselors and employers about Tech Prep.
- State level leadership in certification issues and professional development which supports the implementation of the Tech Prep initiative.
- State agencies should provide services to teach secondary and postsecondary staff how to implement the Tech Prep initiative.
- Changes to personnel certification codes which will allow cross teaching of dual credit courses between secondary and postsecondary by the appropriate instructors.
- Require all teachers, counselors and administrators to complete internships in business and industry once every five years.
- Develop a program to provide teachers and counselors at the secondary level with opportunities to complete observation and internship programs at technical colleges.
- Monitor specific issues such as the acceptance of the applied academics and Tech Prep courses taken in high school to meet college entrance requirements
- Strategies for expanding the transfer of credit between postsecondary institutions, and the development of a 2+2+2 program.
- Formulate a strategic five year plan for implementing and monitoring the Tech Prep initiative to include provisions for: 1. developing operational guidelines, 2. developing performance standards and measures, 3. monitoring the leadership and professional development initiative.
- Align available resources from all existing education and employment training funds and seek additional public and private funds to implement fully Tech Prep in Wisconsin.

Model Programs in Wisconsin

Moraine Park Technical College

Students enrolled at area high schools earn both high school and VTAE (Vocational/Technical and Adult Education) credit for courses which are based on college curriculum. High school teachers teach the courses and are considered VTAE

part time instructors and are certified by the postsecondary system. They are paired with peer instructors from the college. Students do not pay additional fees. Instead, the high school pays the VTAE district for tuition and fees and VTAE district pays for the cost of instruction in an amount equal to the cost of tuition and fees. In 1990-91, enrollments of 454 students studied courses such as Principles of Data Processing, Accounting, Sociology, Psychology of Human Relations, and Written and Oral Technical Communications. Future plans include: a 2+2 model resulting in students exiting with an associate degree and entering the workplace, or continuing for a baccalaureate degree, and; to develop an occupational specific Vocational Diploma 'Plus' program that prepares students to enter the workplace after high school, or to enroll in a two year program.

Fox Valley Technical College and Osh Kosh Area School District

The Fox Valley Technical College and Osh Kosh Area School District operate an advanced standing/dual credit program offered to high school students. High school teachers certified by VTAE in their occupational area provide the instruction. Future plans include 2+2 programs with eight high schools and 2+2+2 programs within two years.

Oregon

Introduction

The state of Oregon in many respects appears to be leading the way in Tech Prep and education reform. Tech Prep, as a vehicle to accomplish many of Oregon's education reform goals, is strongly endorsed by the State Board of Education and the Office of Community College Services. In a joint effort, Norma Paulus, Superintendent of Public Instruction, and Dale Parnell, Oregon Commissioner of Community Colleges, issued *Oregon Tech Prep/Associate Degree Program: Developing a High Performance Workforce*, a policy paper adopted by the State Board of Education as one of a series of policy statements relating to the Oregon School Reform effort. The State Board of Education has adopted the following as a definition of Oregon's TPAD Program:

> The Oregon Tech Prep/Associate Degree Program represents an educational choice that integrates academic coursework with a rigorous technical education concentration. It is a planned sequence of applied academic and professional-technical courses that begin after completion of the Certificate of Initial Mastery and articulate with a postsecondary experience leading to an associate degree. Because the TPAD program

prepares students for a lifetime of learning, it also can provide preparation for advanced education such as a four-year baccalaureate degree. The TPAD program prepares students with the skills and competencies necessary to meet employers performance standards not only for mid-level occupations, but also for career advancement (National Tech Prep Network - *Connections*, July 1992).

What TPAD in Oregon Is and Is Not

TPAD planners in Oregon have developed firm ideas about what the program is and is not.

TPAD IS...

- An avenue to educational reform with emphasis on contextual learning that combines knowing with doing
- The integration of professional-technical education and academic curricula with an applied academics emphasis
- A cooperative secondary and postsecondary program emphasizing continuity in learning
- An avenue with multiple exit points leading to an associate degree and possibly more advanced education
- A curriculum choice for students based upon learning styles and models
- Preparation for a career and continuing education
- A clear curricular structure with substance and focus
- Helping students use information

TPAD IS NOT...

- The same approach to education but with a new name
- Professional-technical education only
- Secondary education only
- A terminal education program
- A tracking approach to education
- Entry-level job preparation only
- General education
- Just dispensing information

Source: *Oregon Tech Prep/Associate Degree Program*

Implementation

The need, and corresponding rationale for Tech Prep cited in this policy statement echoes those pointed out by the work of the Commission on the Skills of the American Workforce, and the Secretary's Commission on Achieving Necessary Skills. The call to action, listed as "Proposed Accomplishments to Implement the Oregon Tech Prep/Associate Degree Program", include:

A. Develop a structured and substance-rich applied academics curricula that provides opportunities for all students to understand the relationship between academic subject matter and real life application.

B. Develop and implement high standards, achievement expectations, assessment policies and procedures for Tech Prep/Associate Degree programs.

C. Develop learning and guidance strategies that allow all students to acquire positive attitudes toward life skills, lifelong learning, and career opportunities.

D. Provide teacher/counselor preservice and inservice programs to help prepare school and college personnel to work in Tech Prep/Associate Degree programs.

E. Develop the Tech Prep/Associate Degree curricula through collaboration among high school and college faculty, regional professional technical education coordinators, education service districts, and employer representatives.

F. Develop strategies aimed at changing student as well as public attitudes about professional technical education.

G. Develop community college bridge programs to prepare adult students to move into Tech Prep/Associate Degree programs.

Source: *Oregon Tech Prep/Associate Degree Program*

Activities designed to accomplish the objectives of Tech Prep in Oregon are detailed and correlated to each of the above goals. Curriculum issues focus on applied academics courses being developed and used in Oregon high schools and community colleges including: Applied Physics, Applied Biochemistry, Applied Communication, Applied Math, Applied Economics, and Materials Science. Efforts are underway to approve these high school courses as appropriate preparation for college entrance. Additional activities called for include: developing postsecondary programs that tie directly to the high school Tech Prep curricula; developing academic curricula that focus on integrating knowing (content) with doing (context); developing Pre-Certificate of Initial Mastery career

exploratory programs; developing or adopting postsecondary associate degree and certificate requirements based on high performance standards; developing outcome-based assessment policies and practices; developing secondary school guidance programs that help all students assess their personal interest, aptitudes, and competencies; re-directing teacher education toward integrating conceptual and contextual learning; involving the employer community in developing the Tech Prep/Associate Degree curricula, and providing employment standards, contextual learning examples, teacher internships, structured work experiences, and other authentic learning experiences for students; utilizing regional Workforce Quality Councils to help identify local training needs and implement the program, and; reviewing the college curricula to assure continuity in learning and elimination of unnecessary duplication brought about by high performance Tech Prep programs in high schools. (Paulus & Parnell, 1992)

Oregon Progress Board Benchmarks

- 93 percent of high school students will graduate from high school by the year 2000.
- 55 percent of high school students will be enrolled in Professional Technical Education programs by the year 2010.
- 70 percent of high school students will complete at least one year of postsecondary education or training by the year 2000.
- 35 percent of high school students will be enrolled in structured work experiences by the year 2000.

Source: *Oregon Tech Prep/Associate Degree Program* (1992)

Policy: Oregon's Educational Act for the 21st Century

The Oregon Educational Act for the 21st Century (adopted House Bill 3565) calls for a restructured educational system to meet the state's goals of having the best educated citizens in the nation by the year 2000 and a workforce equal to any in the world by the year 2010. The perceived importance of preparation in technical and technology areas is evident in two enabling goals adopted by the state: 18% of high school students [will be] enrolled in professional-technical education programs by the year 1995, 35% by 2000, and 55% by 2010 - currently less than 9% are enrolled, and; 18% of high school students [will be] enrolled in structured work experiences by the year 1995, 35% by 2000, and 55% by 2010 - currently less than 3% are enrolled. (PAVTEC Newsletter, Sept. 1992)

House Bill 3565 contains the following principle elements which directly relate to the Oregon Tech Prep/Associate Degree Program:

- Sets education performance standards for all students - called the Certificate of Initial Mastery (grade 10) and Certificate of Advanced Mastery (grade 12) - that are benchmarked to the highest in the world.

- Provides all students, after receipt of the Certificate of Initial Mastery, an opportunity to branch out into educational options to obtain a Certificate of Advanced Mastery with college preparatory or academic professional technical endorsements, or both. The programs design will allow students to move between endorsements, with both endorsement options providing the ability for students to enter a two-year and/or four-year college program.

- Develops comprehensive education and training programs for two- to five-year professional technical endorsements and associated degrees.

- Involves business, labor and education as partners in developing curriculum and performance standards for school-to-work transition programs.

It is not surprising that many of the reform components of Oregon's Educational Act are patterned after those called for in *America's Choice*. Representative Vera Katz, author of HB 3565, is a board member of the National Center for Education and the Economy which sponsored the *America's Choice* study. Ira Magaziner, co-author of *America's Choice*, and presently Senior Advisor for Policy Development in the Clinton Administration, was also influential in the formative stages of HB 3565.

Related Legislation

Three additional pieces of legislation in Oregon aimed at improving education and the quality of the state's workforce were enacted during the 1991 legislative session. The Workforce 2000 Act II (HB 3474) was given a budget of greater than $10 million to continue a series of interrelated partnerships for workforce training and education program development. House Bill 3469, the 1991 Youth Apprenticeship Act seeks to establish apprenticeship pilot programs to aid students in the transition to regular apprenticeship programs. Lastly, HB 3133 authorized the creation of a board comprised of 14 representatives from business, labor, education and human resource development. The board, called the Workforce Quality Council, is charged with recommending changes necessary to improve state policies for workforce education and training. To expand the effectiveness of the council, fifteen regional workforce quality committees have been created to provide a partnership of public and private sector leaders empowered to deliver regional workforce strategy. The committees are the vehicle for reducing unnecessary duplication and integrating service delivery, ensuring a customer-driven system (Oregon Office of the Governor, 1992).

Exemplary Programs

Oregon is the home of two of the nation's leading Tech Prep programs: Portland Area Vocational Technical Education Consortium (PAVTEC) lead by Portland Community College, and Mt. Hood Regional Cooperative Consortium (MHRCC) at Mt. Hood Community College.

Portland Area Vocational Technical Education Consortium

The Portland Area Vocational Technical Education Consortium, or PAVTEC, has been in operation since 1984. Headed by Portland Community College, the program includes 13 school districts and involves more than 160 high schools and over 80 articulation agreements in career clusters such as engineering/technology, applied science, agriculture/horticulture, health careers, and business. In 1992, PAVTEC was awarded the U.S. Department of Education's Exemplary Tech Prep Program award, and was also recognized by the American Association of Community and Junior Colleges as one of three outstanding Tech Prep programs in the country. For information on PAVTEC, contact:

Helen Gabriel, Executive Director, PAVTEC
P.O. Box 19000, RI-B5
Portland, OR 97280
(503) 244-6111, ext. 2574

Mt. Hood Regional Cooperative Consortium

The Mt. Hood Regional Cooperative Consortium represents a partnership between Mt. Hood Community College and 8 school districts. Established in April of 1986, by 1991 the program included 65 articulation agreements in a wide range of fields including accounting, agriculture and horticulture, automotive technology, cable and community television, early childhood education, electronics, engineering technology, hospitality and tourism, journalism, office occupations, and manufacturing technology. A unique feature of the Mt. Hood program is its Vocational Inter-district Program (VIP) which allows students to access Tech Prep programs outside of their high school district with no additional cost to students, parents, or districts. In 1991, Mt. Hood Community College was honored as one of the top three community colleges in the nation for Tech Prep Associate Degree education by the American Association of Community and Junior Colleges. For information on MHRCC, contact:

Dr. Jack Miller, Consortium Chair
Mt. Hood Community College
26000 S.E. Stark Street,
Gresham, OR 97030
(503) 667-6422

MODEL DEMONSTRATION PROJECTS

Nationally, the U.S. Department of Education has recognized 15 Tech Prep Model Demonstration Project sites. Results of an evaluation of these sites will be made available through the National Diffusion Network. The sites selected include:

Charles County Community College, La Plata, MD
Community College of Rhode Island, Warwick, RI
East San Gabriel Regional Occupational Program, West Covina, CA
Francis Tuttle Vo-Tech Center, Oklahoma City, OK
Leander High School, Leander, TX
Lexington County School District #4, Swansea, SC
Luna Vocational Technical Institute, Las Vegas, NM
Mt. Hood Community College, Gresham, OR
Norfolk Public Schools, Norfolk, VA
Oakland County Community College, Waterford, MI
Portland Area Vocational Technical Education Consortium, Portland, OR
Richmond County Schools, Hamlet, NC
Roanoke Area Tech Prep Consortium, Roanoke, VA
Tri-County Technical College/PACE, Pendleton, SC
Seattle Public Schools, Seattle, WA

Information regarding these sites can be obtained from the National Tech Prep Network, P.O. Box 21689, Waco, TX 76702-1689, (800) 972-2766.

TECH PREP IN MONTANA

With the enactment of the Tech Prep Education Act as part of the 1990 amendments to the Carl D. Perkins Act, Montana received $232,615 for program year 1992 to fund the development and implementation of Tech Prep programs in accordance with provisions contained in the Act. In January, 1992 Montana funded four Tech Prep demonstration projects which met the application criteria[1]. Each of these projects is comprised of a three-year plan (program years 92 - 94) which implements one or more of the State Goals for use of P.L. 101-392 funds, and addresses one program area leading to a two-year certificate or Associate's degree.

As reported in Montana's State Plan for Vocational Education, "Perkins Title III, E funds will be granted to provide expanded opportunities for lateral and upward mobility in postsecondary vocational-technical education for vocational students. To facilitate this objective, state staff will endeavor to remove state administrative barriers to articulation agreements [and] to facilitate the transfer of credit between the Montana Vocational-Technical Center System and the other units of the Montana System of Higher Education."

Montana's State Goals for Improvement of Vocational Education and Vocational-Technical Education (Program years 1992 - 1994)

1. Increase student work skill attainment and job placement.
2. Increase linkages between secondary and postsecondary educational institutions.
3. Improve the ability of eligible recipients to meet the needs of special populations with respect to vocational education.
4. Improve the ability of vocational curriculum, equipment, and instructional materials to meet the demands of the workforce.

Source: *Montana State Plan For Vocational Education - Program Years 92 -94.*

The four projects operating in Montana are centered in Great Falls, Billings, Dillon, and Missoula. A description of each of these programs, their objectives, and unique approaches to implementation follows.

1. Due to limited funds, only the projects in Great Falls and Billings were fully funded. The projects in Dillon and Missoula were reduced in scope to match the partial funding received.

Central Montana Tech Prep Consortium

The Central Montana Tech Prep Consortium (CMTPC) is the result of a project grant awarded to the Great Falls School District 1, the fiscal agency, and the Great Falls Vocational-Technical Center, the administrative agency. The grant was awarded for the development and implementation of a 2+2 Tech Prep program focusing on Business and Office Technology occupations. The career cluster, centered around Business and Office Technology occupations, leads to Associate of Applied Science degrees in:

- Accounting Technology
- Administrative Assistant
- Dental Receptionist
- Business Management/Entrepreneurship
- Legal Secretary
- Medical Office Assistant
- Medical Secretary
- Medical Transcription
- Microcomputer Management

This occupational cluster was identified and chosen, in part, because of a projected increase in labor market demand in these occupations through the turn of the century. Local and regional employment demand, as required by P.L. 101-392, also contributed to the selection of this cluster.

The Consortium

The CMTPC initially consisted of six urban and rural high schools - Belt, Centerville, CM Russell, Fergus, Great Falls High, and Simms, the Largent Alternative High School Program, and the Great Falls Vocational-Technical Center as the lead postsecondary institution. As a result of effective promotion of the program, six additional districts have joined the consortium in its first calendar year of operation. The new member schools, who are funding their own participation in the program, are from Cascade, Choteau, Conrad, Fairfield, Shelby, and Valier.

Administrative Structure

The CMTPC operates with a full-time Tech Prep coordinator, Donna Berkhof. A part-time secretary, and a part-time Vo-Tech Co-coordinator complete the Project Staff. Willard Weaver, Director of the Great Falls Vocational-Technical Center, serves as the Project Director, and Dewey Swank, Director of Federal Programs for the Great Falls School District, is the Project Administrator. Key positions on Advisory Committees and organizational teams are filled by members from education and the business community. (See Figure 3)

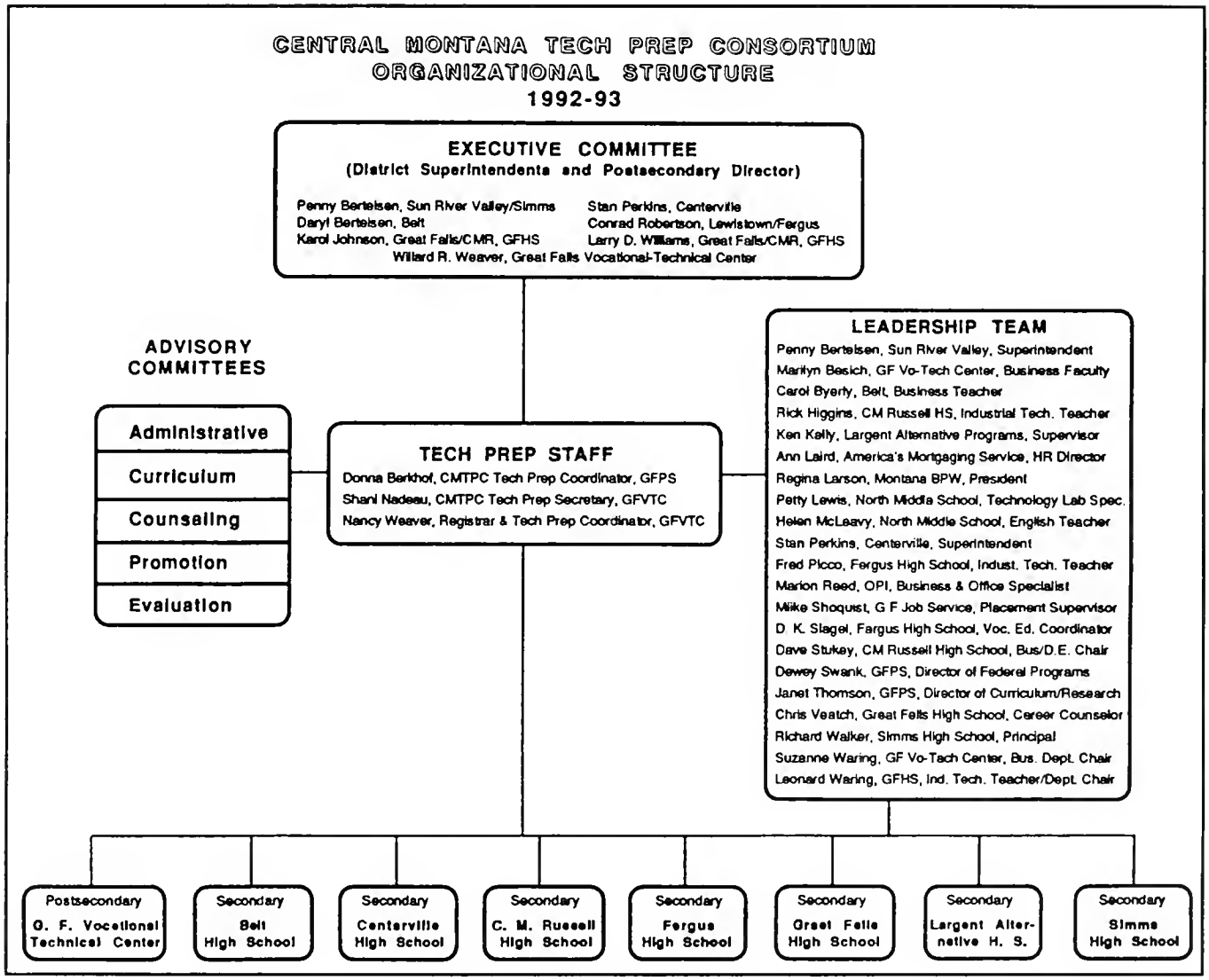


Figure 3

Program Development

With the awarding of the grant midway through program year 92, efforts in the development of the CMTPC program concentrated on defining the local vision for Tech Prep, establishing a leadership team and advisory committees, preparing consortium members through meetings, workshops, presentations, visits to study existing Tech Prep programs in Washington and Oregon, and beginning the articulation process.

Between January and June, 1992, numerous inservice activities and presentations were undertaken to orient participants and inform the public as to the goals and

objectives of Tech Prep. These included:

- Vo-Tech staff inservice
- Centerville middle school and high school staff inservice
- Presentation to parents - Expanding Your Horizons
- Establishment of a Tech Prep Newsletter
- Presentation to Lewistown School Board
- Tech Prep seminar 'Getting Started In Tech Prep' with Dan Hull, Director of the Center for Occupational Research and Development, Waco, Texas.
- A planning and work session involving over forty representatives from business and education

Additional staff development activities included CMTPC delegations attending the inaugural National Tech Prep Network Conference in Dallas, Texas, and touring secondary and postsecondary Tech Prep sites in Spanaway, Washington, and North Clackamas, Portland, and Gresham, Oregon.

Early in the development phase, a Leadership Team comprised of representatives from local businesses, education agencies, and consortium members was established to clarify goals and committee responsibilities, construct a mission statement, develop articulation criteria, and establish program priorities. In June, 1992, the Leadership Team approved a Tech Prep Definition, Mission Statement, and Statement of Beliefs (see Exhibit B), and an updated Administrative Agreement for consortium school boards.

Articulation

The approach to articulation used by the CMTPC employs a curriculum committee to guide and oversee curriculum review and revision, and separate articulation work groups involving more than thirty Vo-Tech and high school teachers who examine and modify curriculum and student outcomes to develop a sequential program of study leading to articulation. CMTPC has adopted the advanced placement model of Tech Prep which sees articulated courses taken at the high school level receive postsecondary credit toward a degree or certificate. At the conclusion of program year one, two courses had been articulated: Keyboarding I and Accounting Procedures I. Year two has seen four additional courses articulated, Keyboarding II, Microcomputer Word Processing, Introduction to Computers, and Speedwriting I. These titles represent the postsecondary components of the articulation agreements, high school course titles vary between schools. Table 1 shows a listing of the high school courses at each consortium school which qualifies for advanced "Tech Prep" credit.

The Curriculum Committee and Articulation Work Groups are currently concentrating on articulating the remaining courses in the Business and Office Technology cluster. Once this has been achieved, efforts will be centered around strengthening core

Central Montana
TECH PREP
Consortium

A 2 + 2 Cooperative Program between the School Boards of Belt, Centerville, Great Falls, Lewistown, and Simms and the Great Falls Vocational-Technical Center

DEFINITION

Technology Preparation (Tech Prep) is a cooperative program carried out under an *articulation agreement* between secondary and postsecondary educational institutions which have made a commitment to the program. The Tech Prep program provides a challenging and technically-oriented enhancement to general programs. Through a coordinated sequence of academic and technical/vocational courses including applied academics, Tech Prep builds student competence in mathematics, science, communications, and technology.

Tech Prep is designed to provide technical preparation in at least one field of •business, •applied science, •health, •mechanical, industrial, or practical art or trade, •engineering technology, or •agriculture. The program provides a nonduplicative sequence of studies which links the last two years of secondary school and the first two years of higher education and leads to an associate degree or two-year certificate in a specific career field and readiness for employment and continuing education and training.

MISSION STATEMENT

The mission of the Technology Preparation (Tech Prep) Program is to assure that all students acquire the academic and technical skills and knowledge necessary to be prepared for life-long learning and employment opportunities in the technologically-oriented society of the future.

BELIEFS

To better prepare students for the world of work and for continued education, the Tech Prep Program will:

- emphasize literacy, problem-solving, decision-making, and group processing skills in a core of foundation classes in communication arts, technology, math, and science, including applied academics
- actively use advisory groups to seek input on curriculum, training needs and program evaluation with partners from secondary schools, postsecondary institutions, business and industry, community leaders, parents, and students
- offer a coordinated sequence of challenging academic and technical/vocational courses which meet high school graduation requirements, link secondary education with postsecondary education leading to an Associate of Applied Science Degree, and to the extent possible meet university entrance requirements.
- promote equity in educational and occupational options for all students and guide students into courses which form a firm academic and technological foundation on which to build their future.
- encourage students as future employees and developing workers to gain and maintain the adaptability necessary to cope with the demands of an increasingly technological environment.

Tech Prep benefits all students by creating an awareness of the evolving needs of the job market and the importance of life-long learning; alerting students to the wide variety of employment, education, and training options available; and better preparing students for the world of work and continued education.

Exhibit B

CMTPC

ARTICULATED CLASSES IN BUSINESS AND OFFICE TECHNOLOGY

SCHOOL	NAME OF H.S. CLASS	V-T #	GFVTC COURSE TITLE	CRDTS
Belt	Intro to Word Processing, 1st sem	OO 107	Keyboarding I	3
	Accounting	BA 101	Accounting Procedures I	3
	Intro to Word Processing, 2nd sem	OO 108	Keyboarding II	3
	Advanced Word Processing	OO 265	Microcomputer Word Processing	3
	Office Practice, 1st sem	OO 172	Electronic Calculators	1
Cascade	Keyboarding I	OO 107	Keyboarding I	3
	Accounting I	BA 101	Accounting Procedures I	3
	Keyboarding II	OO 108	Keyboarding II	3
Centerville	Typing	OO 107	Keyboarding I	3
	Accounting	BA 101	Accounting Procedures I	3
	Word Processing/Word Perfect	OO 265	Microcomputer Word Processing	3
	Microcomputers	CS 110	Introduction to Computers	3
	Clerical Office	OO 172	Electronic Calculators	1
Choteau	Word Processing, 1st sem	OO 107	Keyboarding I	3
	Accounting I	BA 101	Accounting Procedures I	3
	Word Processing, 2nd sem	OO 108	Keyboarding II	3
	Advanced Word Processing	OO 265	Microcomputer Word Processing	3
CMRussell	Information Processing	OO 107	Keyboarding I	3
	Accounting	BA 101	Accounting Procedures I	3
	Advanced Information Processing	OO 108	Keyboarding II	3
	Word Perfect	OO 265	Microcomputer Word Processing	3
Conrad	Keyboarding, 1st sem	OO 107	Keyboarding I	3
	Bookkeeping	BA 101	Accounting Procedures I	3
	Keyboarding, 2nd sem	OO 108	Keyboarding II	3
	Word Processing	OO 265	Microcomputer Word Processing	3
	Computer Applications	CS 110	Introduction to Computers	3
Fairfield	Word Processing, 1st sem	OO 107	Keyboarding I	3
	Accounting	BA 101	Accounting Procedures I	3
	Word Processing, 2nd sem	OO 108	Keyboarding II	3
	Business Systems, 1st sem	OO 265	Microcomputer Word Processing	3
	Business Systems, 2nd sem	CS 110	Introduction to Computers	3
Fergus	Keyboarding	OO 107	Keyboarding I	3
	Accounting I	BA 101	Accounting Procedures I	3
	Keyboarding w. Word Processing	OO 108	Keyboarding II	3
	Comp. Applications/Comp. Science	CS 110	Introduction to Computers	3
	Notehand	OO 176	Speedwriting I	3
GFHS	Information Processing	OO 107	Keyboarding I	3
	Accounting	BA 101	Accounting Procedures I	3
	Advanced Information Processing	OO 265	Microcomputer Word Processing	3
	Office Machines	OO 172	Electronic Calculators	1
Largent	Information Processing	OO 107	Keyboarding I	3
Shelby	Keyboarding/Word Processing I	OO 107	Keyboarding I	3
	Accounting I	BA 101	Accounting Procedures I	3
	Word Processing II	OO108	Keyboarding II	3
	Computer Information Processing	OO 265	Microcomputer Word Processing	3
Simms	Intro to Word Processing, 1st sem	OO 107	Keyboarding I	3
	Accounting I	BA 101	Accounting Procedures I	3
	Intro to Word Processing, 2nd sem	OO 108	Keyboarding II	3
	Model Office: Word Perfect	OO 265	Microcomputer Word Processing	3
	Model Office: Electronic Calculators	OO 172	Electronic Calculators	1
Valier	Keyboarding	OO 107	Keyboarding I	3
	Accounting I	BA 101	Accounting Procedures I	3
	Word Processing	OO 265	Microcomputer Word Processing	3

Tech Prep 5/93

Table 1

competencies in the areas of Mathematics, Science, Communications, and Technology beginning at the middle-school level.

The success to-date of the CMTPC is evidenced by the growth in the number of consortium schools and districts, and by the activity level and enthusiasm of a large number of participants from consortium communities. Progress toward CMTPC's goal of establishing an innovative educational model that will provide Montana's young people with the preparation and training required to enter and succeed in a competitive, rapidly changing workforce, is well underway in central Montana. According to CMTPC coordinator, Donna Berkhof, future goals include expanding the Tech Prep program to the Allied Health, and Trades and Technology clusters, as well as ongoing evaluation and improvement of the current program.

Billings Career Center/Billings Vocational-Technical Center Automotive Tech-Prep Education Project

The Perkins supported project operating in Billings is the result of a proposal to develop and implement a Tech Prep program in Automotive Technology and related career paths between the Billings Career Center - representing Billings West, Billings Skyview, Billings Senior, and Central Catholic high schools, and the Billings Vocational-Technical Center. The program provides a smooth transition from secondary to postsecondary education through a fully integrated, sequential course of study leading to an Associate of Applied Science degree in Automotive Technology or Heating, Ventilation and Air Conditioning (HVAC), or a two-year certificate in Diesel Technology or Auto Body Repair.

The Curriculum

The Billings Tech Prep program is being developed as an Advanced Skills model in which the postsecondary curriculum is revised to be more technically advanced, building on a strengthened core of foundation skills in math, science, communications, and technology developed at the secondary level. The curriculum at the Career Center includes competency-based, basic mechanical technology courses integrated with Principles of Technology, an applied academics core course based on the application of physical and scientific principles in mechanical, fluid, thermal, and electrical systems. Juniors and Seniors attending the Career Center continue their progress toward graduation at their resident high school, but may opt to study English 3 & 4, American History, American Government, or Sociology at the Center.

The Secondary component of the Tech Prep program consists of four semesters

making up the Junior and Senior years in which students study Mechanical Technology three hours per day. The courses studied are:

First Semester	Second Semester	Third Semester	Fourth Semester
Engine Fundamentals	Electric	Engines	Auto Electrical
Power Train	Chassis	Auto Power Train	Suspension
Princ. of Technology I	Princ. of Technology II	Auto Technology I	Auto Technology II

Courses in Automotive Technology and related fields at the Vocational-Technical Center, while moving toward advanced technical skills to receive Tech Prep students, are also being upgraded to further integrate Math, English and Communications development with vocational skills. The postsecondary curriculum will be a logical, sequential extension of the secondary programming in order to maximize the potential of the better-prepared Tech Prep high school graduate.

The entire curriculum - secondary and postsecondary - and its related competency profiles and task lists have been recently reviewed and validated by a Tech Prep, industry advisory board. Further, the outlook on local need for highly skilled technicians in the mechanical technology field has been verified to be greater than average currently, and projected to remain so into the next century.

Administrative Structure

The Tech Prep consortium in Billings operates with a Project Director, Associate Director - Tech Prep coordinators at each school, a team of counselors, two job coaches, a dedicated Tech Prep advisory board, a Curriculum Team and a Promotion Team. Director of the Billings Career Center, David Irion, and Assistant Director of the Billings Vocational-Technical Center, Bob Carr, who serve as Project Director and Associate Director respectively, co-chair the advisory board and work closely with all teams, coordinators and counselors to establish goals and evaluate the program.
A balance of classroom instructors from each institution, and the Tech Prep coordinator from each school make up the Curriculum Team. The Promotion Team is a four member group equally represented by the two Centers.

The advisory board consists of seven members from local businesses, the project Director, Associate Director, and instructors from each institution. According to Associate Director, Bob Carr, one of the most exciting outcomes aside from the students enthusiasm for the program, has been the communication and level of cooperation between instructors at both levels, and between the instructors and the business community.

Program Development

The first program year of the Billings project, from January to June, 1992, was dedicated to establishing the consortium, and planning and conducting numerous inservice activities to prepare participants for implementation in the fall of 92. Teams were formed and work commenced with an examination of the curriculum against national standards established by the National Automotive Teachers Education Foundation (NATEF), the National Institute for Automotive Service Excellence (NIASE), and Vocational Industrial Clubs of America (VICA). In order to prepare for implementation of the secondary curriculum in the fall of 1992, the Joint Curriculum Development Team met on eleven occasions between January and August including a three-day work session during summer break.

Inservice

In March, 1992, eight members of the curriculum development team, the Project Director and the Associate Director, travelled to Portland, Oregon to study existing Tech Prep 2+2 programs. The visit included Mt. Hood Community College and Portland Community College - both of which operate nationally recognized Tech Prep programs - and two high schools, one from each consortium.

On March 25, 1992, the consortium sponsored a presentation on planning and implementing Tech Prep by Dan Hull. In attendance were counselors and administrators from all invited schools, members of the project development team, and representatives from local businesses. Presentations were made to the Billings School Board to describe the Tech Prep project and give an account of first-year activities and progress.

Promotion

Recruitment of students for the fall 92 term included a presentation introducing Tech Prep to all first-year mechanics students at the Career Center. The session, conducted by administrators, counselors and instructors from both institutions, was followed-up by instructors and counselors meeting with each interested student prior to registration. A mailing to all district 10th and 11th grade students included information about the mechanics program, and several local employers were brought in as guest speakers to help promote the Tech Prep project. As a result of these efforts, 42 students enrolled in the second year automotive program, up from 21 a year previous. Continued efforts throughout the 92-93 school year have maintained this growth with 43 students currently pre-registered for second-year automechanics for fall 93.

In April of 93, a breakfast meeting was conducted to further inform all district school counselors - including those from elementary schools - about the program. Getting

information out to parents and the general public has been the responsibility of every participating member of the project with guidance from the promotion team. School boards have been apprised of developments through presentations, and members of the business community have actively participated in selling the program.

Partnership

A feature of the Billings Tech Prep program that the directorship is most excited about involves two, eight-week summer internships for students at local businesses. These paid internships, during which, students are assigned tasks consistent with their development and program of study, are offered during the summer following graduation from high school, and again between the first and second year of the postsecondary program. During the internship, each student will be visited once per week for four weeks, then every other week by two job coaches - one from the Career Center and one from the Vocational-Technical Center. The visitations will provide further guidance in skills and career development, and also provide for a smooth transition between mentors from one educational level to the next.

The first internships will occur during June/July 1993, and will see seventeen males and one female student placed. Response from the business community has been very positive with twenty-nine worksites having committed to the program to date.

Future Direction

With the project entering its third year in Billings, Tech Prep administrators are considering options for expanding into other program areas. Dave Irion, convinced of its merits, would "eventually like to see Tech Prep a part of every vocational offering at the Career Center." Bob Carr reports that the advisory board for the Business program area at the Vocational-Technical Center is currently looking into Tech Prep for future implementation.

Western Montana College Tech Prep Consortium

Western Montana College is the lead institution of a Tech Prep project titled, Articulating Information Processing Education for Montana 2000. Funded in 1992, the project shares the same timeline as the three other federally funded projects in Montana. Western's program is a time-shortened, or advanced placement, 2+2 course of study which begins with the junior year in high school and leads to an Associate of Science degree in Information Processing.

The Consortium

The consortium consists of Anaconda, Butte, Beaverhead County, Darby, Rapelje, Reed Point, Ronan, Superior and Sheridan high schools, the Anaconda Job Corps, Montana State Prison, and Western Montana College. Administrators, teachers, instructors, and counselors from the consortium member schools and institutions serve on a variety of committees and work teams. Additionally, lead persons from each member site coordinate consortium activities. These lead persons are listed as follows:

Glenda Elser, Dillon
Ron Haffey, Anaconda
Percy Craddock, Butte
Jack Powers, Deer Lodge
Rod Olson, Reed Point
Laurel O'Rourke, Sheridan
Bill Hickey, Anaconda
Sue Jensen, Dillon
John Hughes, Darby
Wayne Erfle, Rapelje
Dave Eddington, Ronan
Dick Richardson, Superior

Administrative Structure

The administration of Western's Tech Prep project is headed up by half-time coordinator, Glenda Elser, who also holds the title of Project Director, and has teaching assignments in the Information Processing program. Other faculty and/or administrators chair the Curriculum, Articulation, Evaluation, Marketing and Staff Development Committees.

A leadership team responsible for initial and ongoing development of the program is made up of the Tech Prep coordinators from each of the sites and comprises a mix of teachers and administrators.

An advisory board representing area business interests is in place to validate curriculum developments and student competencies, provide opportunities for job shadowing, and assist in promoting Tech Prep.

Program Development

Activities of the Western Montana College consortium have centered around curriculum review and revision, and in-service development of participants. In March 1992, the project director attended the first National Conference of the National Tech Prep Network in Dallas, Texas. During the first program year, committees were formed and goals of the project were further developed. The curriculum committee began examining and developing course competencies for articulation of math and computer

courses. Competency-based pre- and post-tests for computer literacy and math were in place at Western Montana College for the 92-93 school year. The business advisory board has actively participated in the process and has validated student competencies in these areas.

Postsecondary courses targeted for articulation and advance credit include: EDTECH I and EDTECH II - computer literacy courses, Business Math, Business Communications, Word Processing, and Microcomputer Applications. With a target of advancing credit approximately equivalent to one semester, Speedwriting and Keyboarding may be considered next.

Inservice

Inservice activities have included meetings, tours, and presentations. In September 92, administrators, counselors and teachers from the consortium along with business representatives, met at Fairmont for an organizational, and information sharing session. In October a traveling computer lab, which was purchased for activities of the Tech Prep project, was used to present a workshop at the Montana Vocational Association's Fall Conference. An inservice in applied academics, featuring four speakers from Lewis and Clark State College, was held in November and was co-sponsored by Western Montana College and Butte High School which funds its own Tech Prep involvement. From January 31 to February 4, 1993, three members of the consortium took part in the bus tour of Tech Prep sites in Washington and Oregon mentioned earlier.

Promotion

Promotion of the project has included presentations to school boards, and involving school counselors in marketing vocational education to secondary students. A newsletter is used to share information and encourage communication between consortium members. A unique feature of this project, the travelling computer lab, further promotes the program while providing a state-of-the-art resource to member schools and institutions. The computer lab consists of: ten notebook computers - each with a mouse and running Windows, four color LCD projection panel, an overhead projector, a portable scanner, an internal modem in one computer, a dot matrix printer, a LaserJet printer, a PaintJet printer, a digital print server, and surge protectors. The software which accompanies the lab includes: Windows, DrawPerfect, Quatro-Pro, Paradox, Pacioli Accounting, WordPerfect Works, Harvard Graphics and various other packages. During the 92-93 school year, the lab was used for inservice activities and travelled to Beaverhead County High School. Program year three will see the lab scheduled for four to six weeks at each member school that requests it.

Looking Ahead

The summer of 93 will see another goal of the consortium come to light. The Minerals Division of Pfizer, Incorporated will initiate a job shadowing program for teachers to experience first-hand the technology used in the workplace. Involved in the pilot for this program will be a school teacher from Beaverhead High School. Scheduled for summer 94 is the first offering of a three-day computer camp for up to twenty-five high school students who are interested in the Tech Prep program. Students will learn about Information Processing and the current technology being used in the field.

Missoula Vocational-Technical Center Tech Prep Consortium

The Tech Prep program established by the Missoula Vocational Technical Center and area high schools involves a four-year program in Microcomputing Technology. The program of study includes the junior and senior years in high school followed by two years of postsecondary study. The program leads to an Associate of Applied Science degree in Microcomputing Applications and Systems.

The Consortium

Consortium member agencies involved in the Microcomputing Tech Prep program are: Alberton High School, Arlee High School, Corvallis High School, Darby High School, Florence-Carlton High School, Frenchtown High School, Hamilton High School, Loyola-Sacred Heart High School, Plains High School, Ronan High School, St. Ignatius High School, St. Regis High School, Stevensville High School, Superior High School, and Missoula County High Schools - Big Sky, Hellgate, Seeley-Swan, and Sentinel.

Administrative Structure

The Missoula program operates with a part-time coordinator, Chris Heyer, who also teaches courses in the program area. Administrators, teachers, counselors and business representatives serve on the following committees: Leadership Committee, Curriculum Committee, Information/Promotion Committee, and Evaluation Committee.

The Leadership Committee, made up of administrators of consortium member institutions and industry representatives, is responsible for developing goals, guidelines, and procedures, overseeing the progress of the other committees, and coordinating activities of the consortium. The Curriculum Committee is responsible for developing competency-based curriculum, and criteria related to student competencies and articulation.

The Information/Promotion Committee concentrates on marketing the program and coordinating information within the consortium. The Evaluation Committee is responsible for establishing performance outcomes for the assessment of student achievement, as well as conducting program evaluation and recommending program changes as necessary.

Program Development

The first year and a half of this project was proposed to be developmental with implementation to occur during the third year. Preparatory work has involved the committees and individual consortium members in various inservice, and development activities. Three members of the consortium attended the National Tech Prep Network Conference in Dallas in March of 92. Two members travelled to North Carolina to attend a regional Tech Prep Conference and visit an existing Tech Prep program during the summer of 92. Information from these experiences was shared with consortium members through meetings and inservice activities.

The Computer Technology Advisory Committee, consisting of eleven local and regional business representatives, has been active in support of the Missoula program. Teacher internships with business and industry are currently being considered.

Curriculum

The Curriculum Committee - currently the most active according to the project coordinator - has been concentrating on revisions to the secondary core curriculum which includes: Algebra, English Composition, Oral Communications, Science, and Computer Technology. Career specific courses at the high school level include: Accounting, Keyboarding, Word Processing, Computers, and Business Courses. Articulation criteria is being developed and, although the program was proposed to be an advanced skills rather than a reduced time program, postsecondary credit is being considered for some courses taken at the secondary level.

Future Goals

Looking ahead to program year three, the consortium endeavors to implement the curriculum fall semester 93 with evaluation of the program to run concurrently. Continued inservice activities and marketing of the program to students, parents and the public will be conducted in the coming year. An objective of the Leadership Team will be to begin the planning and development of a second Tech Prep program in a separate occupational area using the Microcomputing Program as a model.

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PART III

INITIATING TECH PREP EDUCATION

PART III: INITIATING TECH PREP EDUCATION

STRATEGIES FOR PLANNING AND IMPLEMENTING TECH PREP

In developing a plan for initiating a Tech Prep program, the objectives of the Tech Prep concept should be kept foremost in mind. Because Tech Prep seeks to benefit students who traditionally pursue a general track curriculum by offering them a relevant, focused, context-based alternative, the key to designing each program lies with the students it is to serve. Who are they? How do they learn? What job markets can they access? What will motivate them to pursue a technical career?

No two Tech Prep programs are exactly the same, however there does seem to exist a common set of arguments which should be considered when planning a Tech Prep program. Several of these are addressed by Dan Hull and Dale Parnell in *Tech Prep Associate Degree: A Win/Win Experience* as follows:

- It is important to use a competency based approach based on a job analysis and task listings derived from employer input to the question "What do your technicians need to know and do in order to perform satisfactorily in their current jobs and to be able to move up the career ladder?"

- A program advisory committee should be used in developing the task listing which will lead to the core curriculum to be taught at the secondary level.

- Jobs and curricula from a number of related specialty areas should be grouped in "clusters" and the curricula sequenced to form a common core of courses to be taught at the secondary level.

- Curricula models of courses appropriate to the participants of the consortia should be developed in a logical arrangement of teaching/learning objectives. Secondary courses should be in a common core of the cluster and be verified by employers to provide entry level, employable skills and knowledge, in the event the student does not continue on to full time postsecondary studies.

- Consideration should be given to the preparatory and exploratory nature of the ninth and tenth grades in order to build a foundation for the technical courses introduced in the 11th and 12th grades. Postsecondary curriculum should comprise advanced-skills courses that were not possible in two years prior to Tech Prep programs.

Another issue which will need to be examined relates to the type of Tech Prep program that will emerge. Tech Prep programs are broadly classified as one of two types: advanced placement or advanced skills. Both types eliminate duplication of previously mastered content and skills, but advanced placement allows students to complete the program in less time by offering postsecondary credit for high school courses. The advanced skills program requires an upgrade of postsecondary curriculum to match higher skill levels required by business or industry. Both programs may require curriculum revision to coordinate competency-based student outcomes, eliminate duplication between secondary and postsecondary levels, and to ensure that what is being learned is consistent with the skills needed in the chosen career field.

Of course, all Tech Prep programs should build on a strong foundation of basic academic competencies in math, science, and communications. This requires marketing the Tech Prep concept to teachers in the academic disciplines. Methods of achieving applied academics vary between sites, ranging from adopting applied academics curriculum to be taught by either an academic or vocational teacher, to teams of vocational and academic staff collaborating to co-develop and team teach curriculum. The decision as to which method will work best will necessarily need to be made by a site administrator or administrators; in either case, the benefit of blurring the distinction between academic and vocational preparation should not be overlooked.

Yet another consideration to make when planning for Tech Prep involves entry and exit points. Existing variations on the 2+2 model include: 4+2 (grades 9-12 plus 2 postsecondary), 2+2+2 (grades 11 and 12 plus two postsecondary plus an additional 2 postsecondary), and 4+2+2 (grades 9-12 plus 2 plus 2). Which design best suits a program will depend upon factors such as postsecondary programs available, financial resources, and needs of the local job base. In making this decision it should be kept in mind that Tech Prep articulation is not a process of simply comparing course descriptions and signing articulation agreements: the design of a true Tech Prep articulation will require full participation from members of all involved educational levels and representatives of the business sector to fully coordinate the program of study.
Given these sometimes complex issues, a method of establishing teams of committed personnel, and key people to head up these teams is essential. A number of resources have been developed to assist in the planning and implementation of Tech Prep. Following, is a summary of two of these which are widely regarded as leading resources in the field.

Resources

Tech Prep Associate Degree: A Win/Win Experience by Dan Hull and Dale Parnell (1991), is a resource replete with a compilation of testaments from the field. It is comprised of chapters written by administrators, participants and practitioners in the Tech Prep reform movement. Addressed are a multitude of questions and issues concerning Tech Prep including the role of applied academics, steps in developing and implementing a Tech Prep program, examples of working Tech Prep programs, Tech Prep programs for adults, recruiting and retaining Tech Prep students, building employer/educator partnerships, and appendices which include curriculum models for TPAD, facts about applied academics, using applied academics to improve general and vocational education in the high school, and further references and resources.

Getting Started

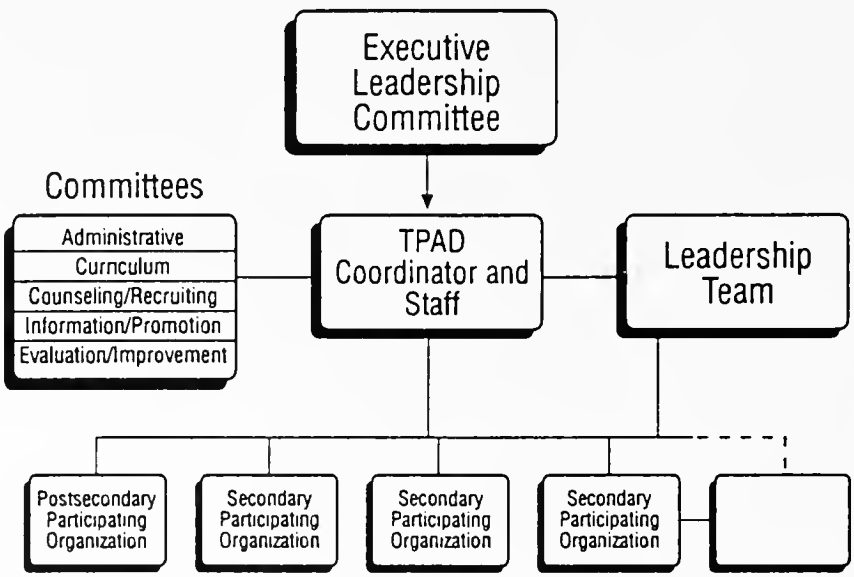
For those just getting started in Tech Prep, the book addresses issues to be considered during the planning phase, for example:

> A Tech Prep consortium should consist of representatives from postsecondary institutions, high school and/or area vocational centers, employers, [and] civic, parent, or economic development groups. A Tech Prep coordinator, usually a staff person from a college [postsecondary institution] or high school, must be selected. Important considerations for the budget of a Tech Prep program include: coordinator, clerical support for coordinator and for committees, travel to attend state and regional work shops, visits to successful Tech Prep programs, materials and supplies, paid time for participating faculty and counselors to prepare curriculum/guidance materials, support for meetings, development of a student/counselor handbook, development of promotional/recruitment material, promotion through news releases and newspaper ads, and consultants if needed. The following committees or working groups are recommended as part of the organizational structure: Leadership committee; Implementation committee, Curriculum Development committee; Information/Promotion committee, and; Evaluation committee. (See Figure 5)

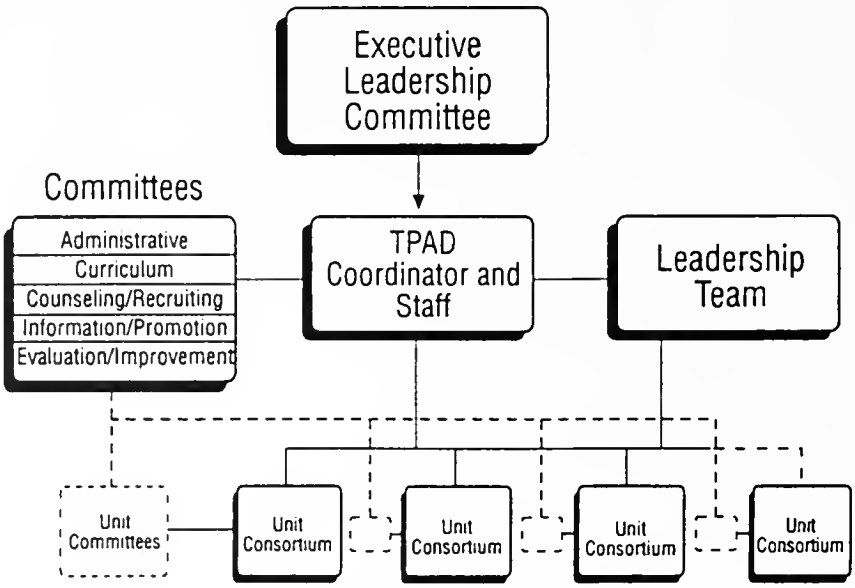
This resource also lists a number of objectives to keep in mind when re-writing the curriculum. These include the need to:

> Develop a competency-based curriculum; install the applied academics curriculum and teaching methods at the secondary level; design the secondary portion of the Tech Prep curriculum toward a career cluster

Suggested Organizational Structures for TPAD Consortia



A. Structure for simple consortia (usually one postsecondary institution)



B. Structure for complex consortia (two or more postsecondary institutions)

Source: *Getting Started In Tech Prep*

Figure 5

instead of a narrow specialty; design the postsecondary Math, Science, and Technical courses to ensure continuity in learning and accommodate students' accomplishments from the secondary curriculum, and; provide additional advanced-technology courses and/or work experiences at the postsecondary level.

Steps To Guide The Process

During the first two phases of development, Planning and Designing the Tech Prep program, an action plan must be developed. The authors of *Tech Prep Associate Degree: A Win/Win Experience* provide the following guidelines for formulating this plan:

1. Identify institutions that would benefit from articulated Tech Prep programs.
2. Identify advanced-level technical occupations that are suitable for the Tech Prep curriculum and garner the support of key employers.
3. Arrange for CEO's of participating institutions to agree on goals to be achieved through articulation and to execute a written statement of their intent to develop an articulated Tech Prep program (an Executive Articulation Agreement).
4. Meet with faculty, administrators, and counselors of all institutions to explain the program; appoint Implementation, Curriculum Development, Information/Promotion, and Evaluation Committees and select the coordinator.
5. Determine job descriptions and competencies; design curriculum/course sequence accordingly.
6. Determine course objectives and necessary lab activities; establish proficiency levels for course objectives.
7. Identify courses/objectives that can be delivered at the secondary institutions - there should be provisions for teaching secondary classes at postsecondary institutions and vice versa to provide for the most effective use of facilities and human resources.
8. Develop secondary/postsecondary Tech Prep curriculum and administrative guidelines.
9. Determine each institution's requirements and commitment to accomplish its Tech Prep component.
10. Establish a system to certify competencies for educational accomplishments of students in articulated courses to use when they apply at the next educational level.
11. Develop a plan to evaluate the Tech Prep program on a periodic basis.
12. Develop and execute an administrative articulation agreement. This should at least provide details of the working articulation procedure, establish courses to be articulated, spell out articulated course competencies, describe required proficiency levels and criteria for measurement, establish the evaluation plan and process, and specify a renewal date for the agreement.

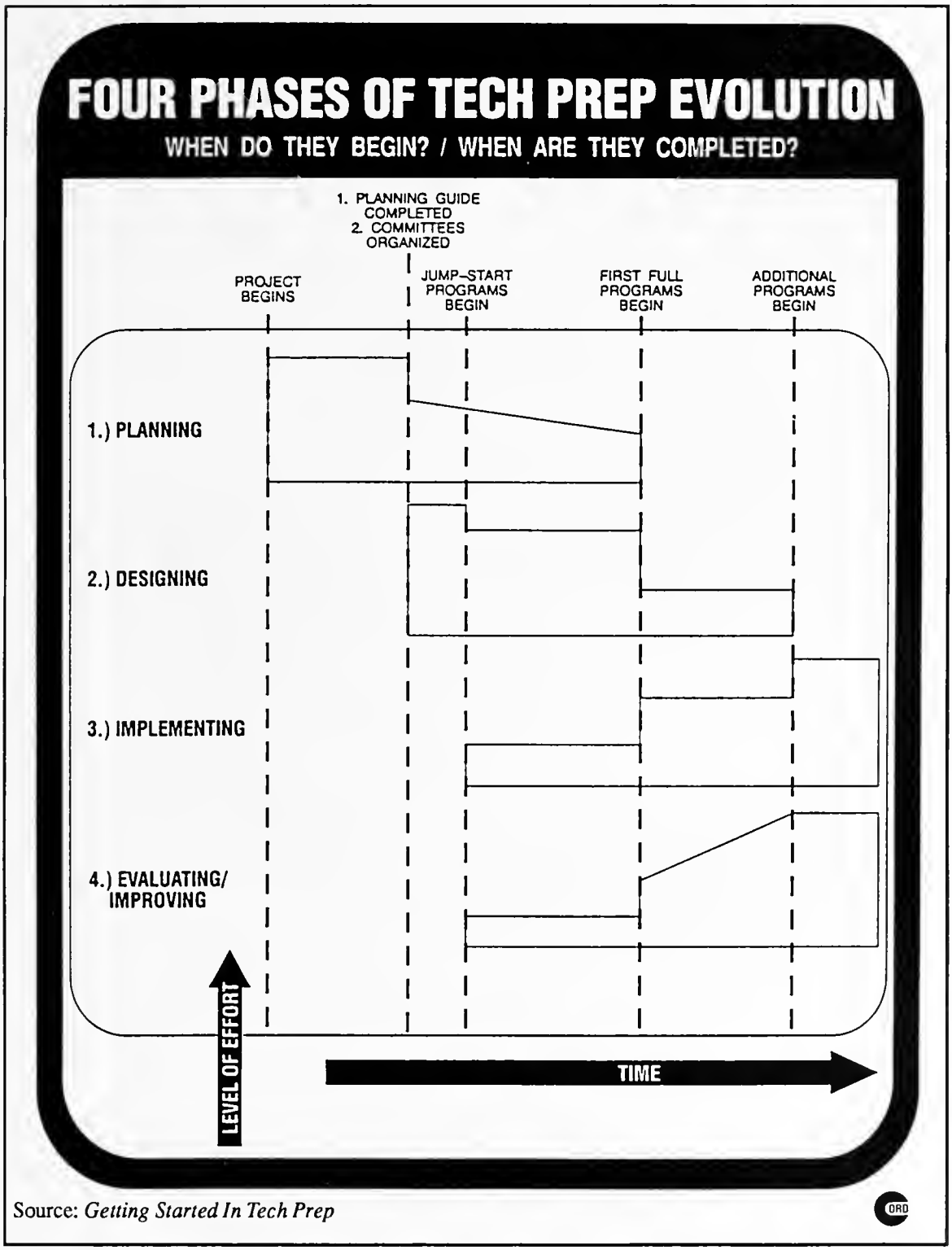
13. Prepare guidance material to inform students.
14. Publicize the Tech Prep program to students, parents, and employers.
15. Develop strategies and incentives to maximize student retention in Tech Prep programs.
16. Arrange access to the program for postsecondary students who did not participate in the high school articulation program. This is extremely crucial in the first five years of the program which will see a high number of students who did not receive the high school Tech Prep background. One way to address this is to provide a Tech Prep equivalent curriculum in the first term of the post-secondary program.

Getting Started In Tech Prep, by Dan Hull (1992), is a resource guide/workbook containing 20 activity oriented units that can be used by the planning teams to put the consortium together and get it running. The guide is presented in three sections: I. Developing an Action Plan; II. Getting Organized, and; III. TPAD Planning Issues and Resources. Because the author also co-authored *A Win/Win Experience*, a shared approach and a considerable amount of duplication is found in this resource. However, the guide provides detailed examples with sample forms to be used as they are, or tailored to individual programs. The following is a summarization of those strategies and objectives detailed in this guide which have been common among many of the Tech Prep programs studied.

Part I of *Getting Started in Tech Prep*, titled Developing an Action Plan, addresses the earliest phase of Tech Prep planning: that of conceptualizing and beginning to formulate the plan. This stage is further delineated into six formative activities: Defining your specific Tech Prep program; Recognizing the four phases of Tech Prep program evolution; Outlining specific steps in planning the program; Assessing the environment and identifying key groups and individuals; Forming and equipping the Leadership Team, and; Setting goals, strategies to achieve the goals, and measures to assess progress toward the goals.

Defining the Tech Prep program involves answering the questions and considering the issues discussed earlier in this section. One additional point offered in this guide suggests that all members of the consortium should reach a consensus as to the elements that make up the definition.

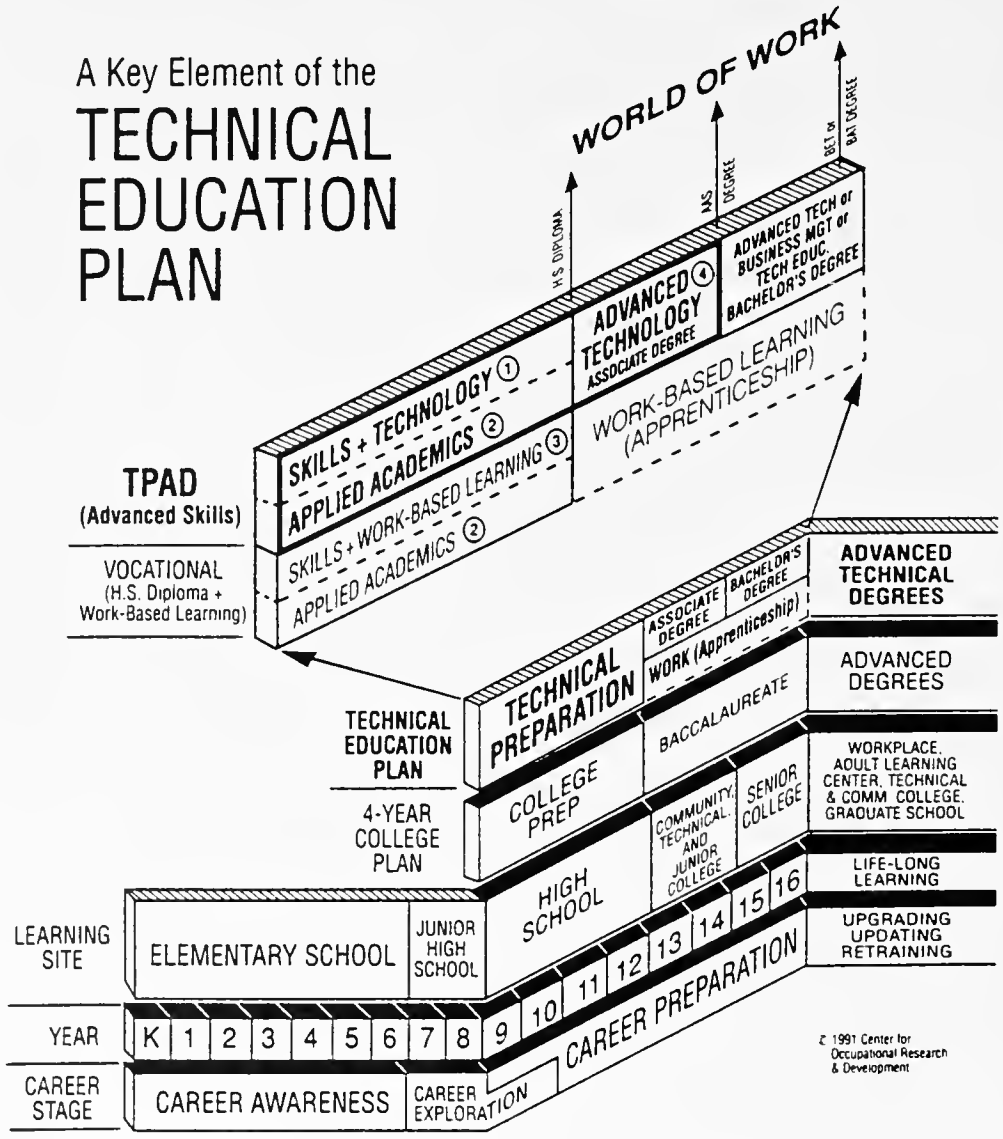
The four phases of Tech Prep program evolution commonly accepted are: 1. Planning, 2. Designing, 3. Implementing, and 4. Evaluating/Improving (See Figure 6). These phases involve a different group or groups of participants, and the entire evolution is cyclic: upon evaluating the program, and identifying necessary improvements, the process of planning, designing, and implementing these changes begins again.



Source: *Getting Started In Tech Prep*

Figure 6

TECH PREP/ASSOCIATE DEGREE (TPAD)
The K-12. . . 14. . . 16 Connection



TECHNICAL EDUCATION PLAN LEGEND

① Technology (Clusters)	② Applied Academics	③ Skills + Work Based Learning	④ Advanced Technology
i.e	i.e	i.e	i.e
Electronics, hydraulics, graphics	Applied Math 9-10 grades	Masonry	Telecommunications
Health	Principles of Technology 10-11 grades	Machining	Computers
Business	Applied Biology Chemistry 9-10 grades	Welding	Manufacturing
	Applied Communications 10, 11 or 12 grade	Secretarial	Lasers/Optics
		Food Service	Nursing
			Information systems

Source: *Getting Started In Tech Prep*

Figure 7

It is suggested that the planning phase be conducted primarily by the Tech Prep Coordinator/Project Staff and the Leadership Team. The work of these groups should result in a written consortium development plan which details what is to be achieved, why it is to be achieved, how it is to be achieved, when various benchmarks are to be reached, and who is responsible for each element.

The design phase should be conducted by the various committees with representation from all participating agencies, groups and organizations. During the design phase, components of the program to be identified, developed, assigned and scheduled include:

1. Curriculum
2. Guidance and Counseling
3. Information, Promotion and Marketing
4. Staff Development
5. Articulation Policies/Procedures
6. Articulation Agreements
7. Jump-Start Activities and Programs.

The implementation phase involves implementing the curriculum and recruiting students for the appropriate courses. At this time informational/promotional activities to disseminate information to students, parents and the community should be increased. Evaluation and improvement of the program begins at the point where progress toward achieving the goals of the program are first identified and is an ongoing process throughout the life of the program.

A model developed by the Center for Occupational Research and Development, (Figure 7), is designed to aid program participants in conceptualizing Tech Prep. The model illustrates the parallel nature of the Technical Education Plan to the 4-year College Plan, and provides insight into the options available to students with Tech Prep.

These resources and others are available from:

The National Tech Prep Network
601 Suite C Lake Air Drive
Waco, TX 76710
(800) 972-2766

Additional Resources

In 1992, the East Central Curriculum Coordination Center of the National Network for Curriculum Coordination in Vocational and Technical Education (NNCCVTE) was designated as the National Tech Prep Clearinghouse of Resources. The Tech Prep collection includes resources on articulation agreements, program sequence, exemplary programs, promotional materials, brochures, video tapes, specific 2 + 2 or 2 + 2 + 2 programs, sample RFPs, proposals, certificates, reports, articles, and a list of state Tech Prep contacts. (NTPN *Connections*, May 1992)

For additional information, contact:

East Central Curriculum Coordination Center
Sangamon State University, F-2,
Springfield, IL 62794-9243
(217) 786-6375

PART IV

RECOMMENDATIONS

PART IV: RECOMMENDATIONS

Tech Prep serves a large segment of the student population by better preparing them for further education or successful entry into the increasingly technological workplace. It can also be argued that Tech Prep could benefit all students. Recent educational and cognitive research on the value of contextual or situated learning has made the case that both academic and vocational learning can benefit from applied problem-solving in a work setting (Kazis & Roche, 1991). The result is a net gain for students, communities and our state.

Recommendation: Appropriate state education agencies and boards of education should commit to an initiative which makes Tech Prep a major focus of educational reform.

Recommendation: The Office of the Commissioner of Higher Education, the Office of Public Instruction, in collaboration with other state and local education agencies, associations, and boards, the State Department of Labor and Industry, labor unions, the Montana Council on Vocational Education, and private business and industry groups, should establish a Task Force/Steering Committee to plan, promote, implement and guide the Tech Prep Education Reform Initiative.

The Task Force/Steering Committee should examine:

1. Goals and objectives of Tech Prep in Montana
2. Promotion and marketing of Tech Prep
3. Effective implementation strategies
4. Secondary/postsecondary coordination
5. Articulation and cross credit issues
6. The impact of accreditation standards, and graduation and college requirements on Tech Prep
7. Regional occupational needs and how Tech Prep can be implemented to meet those needs
8. Career paths and clusters appropriate for Montana
9. Access and assessment issues
10. The involvement of, and coordination with business and industry

As the key to successful development of Tech Prep, promotion and marketing should initially be a major activity of the Task Force or an appropriate state agency. The group or groups responsible for this phase should sponsor a series of workshops to further disseminate purposes, benefits and implementation strategies of Tech Prep.

Recommendation: The best features of the four pilot projects in Montana should be complimented with the best elements of out-of-state projects to form a State Model for Tech Prep.

The State Model should reflect and further the objectives of the State Plan for Vocational and Technical Education. Because it will form the basis for future Tech Prep efforts in the state, the State Model should be designed with greater breadth and flexibility than the federal definition of Tech Prep so as to ensure eligibility in the event of reauthorization of the Tech Prep Education Act in 1995.

Recommendation: All secondary and postsecondary institutions should be engaged in applied academics curricula and articulated programs inherent of Tech Prep by the 1996-97 school year.

A Tech Prep Initiative in Montana should not be limited to certificate and associate degree programs. Many programs, commonly called 2+2+2, are emerging which articulate associate degrees with baccalaureate programs. Continuity in our education system leading from high school through two or four years of postsecondary education or training will provide maximum benefits and flexibility to students and programs. The development or adoption of applied academics courses which could meet inter-disciplinary requirements for graduation and entry into postsecondary institutions will provide additional choices to students. Further, it should not be interpreted that Montana's Tech Prep program would terminate only in postsecondary education. A sound school-to-work transition component should be an essential element of the State Model.

Recommendation: The Office of Public Instruction, Board of Public Education, Office of the Commissioner of Higher Education, Board of Regents and other involved agencies and associations should collaborate to remove the barriers to cross-credit courses and articulation.

Due to Tech Prep's focus on articulated programs and interdisciplinary integration, success in this effort is precursory to the development of Tech Prep consortiums throughout the state. Issues such as team teaching, incentives for professional development, a re-examination of existing certification practices, and a rigorous effort to redesign curriculum and identify core competencies should be central to actions taken. Efforts commenced by the Montana Council on Vocational Education regarding articulation and cross-credit, and policy initiatives of states such as Oregon, California, Indiana, North and South Carolina, Maryland and Wisconsin should be closely examined.

Recommendation: The Montana Legislature should appropriate additional funds in an amount equal to that received from the Perkins Act, Title III, Part E, specifically for the advancement of the Tech Prep Education Reform Initiative.

Every student in Montana should have equal opportunity to enroll in Tech Prep. For this to occur, additional funding will be required for startup activities such as: team development/modification of curricula; staff development in guidance and in the methodology of applied academics; marketing, and; purchase of up-to-date equipment and materials. While the initial investment would be substantial, the cost of maintaining a state-wide Tech Prep program could be expected to be significantly less. The benefits of articulation, dual credit through consortia, shared resources (where possible), and a more productive, globally competitive workforce, could ultimately result in a cost savings. Tech Prep should be viewed as a wise investment in Montana's future.

Recommendation: Teacher Education programs in Montana should include and deliver instruction in applied academics methods in their undergraduate and graduate courses.

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